THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

COMPUTERWORLD

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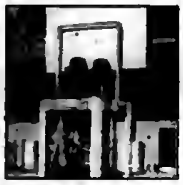
Family Tree
DEC — Three from MIT/87

In Depth
E. F. Codd's relational rules/ID/1



In Depth
With Gordon Bell at The Computer Museum/ID/10

Foreign affairs
ICL's Peter Bonfield on his firm's turnaround past and plans for the future/30

FBI probes piracy claim

Pagetec case represents first agency investigation

By James Martin

PHILADELPHIA — A scientific publishing firm here and a New York-based typesetting concern are under examination by the Federal Bureau of Investigation and face civil suits based on allegations that they illegally duplicated a software program sold by Pagetec, Inc. of Westlake Village, Calif.

A $3 million lawsuit, filed Oct. 4 in U.S. District Court in Philadelphia by attorneys for Pagetec, alleges that the Institute of Scientific Information publisher engaged in breach of contract and trade secret misappropriation in its software licensing agreement with Pagetec. According to the suit, the institute provided Ralph Garner Associates, a New York typesetting firm, with an unauthorized copy of the $4,800 data base publishing program licensed by Pagetec. Named as defendants in the suit were the institute and its president, Eugene Garfield, and Ralph Garner Associates and its president, Ralph Garner.

Meanwhile, the FBI said its investigations of the institute and Ralph Garner Associates produced "positive results." Industry sources said they believe these are the first formal federal probes of a software piracy case. FBI agents, after having searched data processing and management information systems departments at both locations, reportedly uncovered an unauthorized copy of Pagetec's Versacomp at Garner's New York office as well as an undisclosed number of allegedly pirated copies of Micropro International Corp.'s Wordstar programs.

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TOP OF THE NEWS

An Intel Corp. news conference this Wednesday is expected to host the unveiling of the prototype of the Intel 80386 chip, the Santa Clara, Calif., vendor's 32-bit, 16-MHz offering. With the 80386 here, can a new IBM Personal Computer line be too far behind?

■

Things may still be blue at IBM with third-quarter financial results — expected after press time — predicted to be slightly below last year's levels. Among leading IBM analysts, Morgan Stanley's Ulric Weil expected the firm to earn $2.45 per share in the quarter ended Sept. 30, as did Frederic Cohen of L. F. Rothschild, Unterberg Towbin. Prudential-Bache's Carol Muratore was slightly more optimistic, with a $2.55

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Users tie snags to Ideal, DBMS

By Charles Babcock

NEW YORK — Idiosyncracies in the Ideal fourth-generation language can significantly impact performance when applications built with the language are employed with a relational data base management system, several commercial users of the product said last week. Ideal was used to build a controversial New Jersey Department of Motor Vehicles system that has created a widely reported bureaucratic snafu [CW, Sept. 30].

But other users interviewed by *Computerworld* said Ideal, a product of Applied Data Research, Inc. in Princeton, N.J., per-

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AT&T adds hybrid unit, supermicro

By Eric Bender

NEW YORK — Marching further into the small systems arena, AT&T Information Systems last week unveiled a number of microcomputer-related products. Among them was a desktop unit, called the PC 6300 Plus, offering the unique ability to run applications concurrently, on one microprocessor, under both MS-DOS and AT&T's own Unix operating systems.

From AT&T's point of view, according to industry analyst George Colony, the unit "will give users what they want today — Microsoft Corp.'s MS-DOS — and the ability to experiment with the operating system of the future."

Colony and other observers, however, questioned user demand for Unix capability in a desktop.

Also announcing MS-DOS desktops last week was Honeywell, Inc., which announced two units said to be compatible with IBM's Personal Computer XT and AT (see story page 12).

Other products released by AT&T included a mid-range supermicro, a more powerful Unix PC, a nonproprietary version of its Personal Terminal voice/data device, the first printers it has manufactured internally, a host of software and other options.

It was the PC 6300 Plus, however, that grabbed the spotlight at concurrent news conferences in San Francisco and New York. AT&T claimed it produced a unique machine, and specifications indicate it is somewhat of a hybrid of the IBM Personal Computer AT and Personal Computer XT. Using the Intel Corp. 80286 processor, the $5,095 machine runs MS-DOS applications

Continued on page 4

FYI

'USA Today': Satellite network delivers daily

By Paul Korzeniowski

ARLINGTON, Va. — William O. Hider knew that communications technology would play a critical role in the publication of *USA Today* when Gannett Co. made him the publication's 12th employee during the paper's formative period in 1981. Since that time, as vice-president of telecommunications, Hider has transformed a blueprint for production of a national, four-color, graphics-oriented newspaper into one of the world's largest and most sophisticated facsimile and satellite networks.

Hider was hired by Gannett from the ranks of American Satellite Co. in Rockville, Md., which builds the transmission equipment and maintains the satellite network for *USA Today*. At American Satellite, he proposed the network eventually chosen to transmit the newspaper.

"Gannett's thinking was that the person who designed the network was the best person to implement it," Hider said. "So the company made me an offer I couldn't refuse."

The heart of the *USA Today* system is an American Satellite dish antenna,7 meters in diameter, that sits on top of the passageway between two high-rise Gannett office buildings in a suburb of the nation's capital. The dish, with a bandwidth of 300K bit/sec., divided into two 150K bit/sec. channels, sends data to an orbiting Western Union Corp. Westar III satellite. The satellite, in turn, relays the data to 31 print locations scattered across the U.S., each equipped with a 5-meter receive-only satellite dish.

The system can transmit a black-and-white page in three minutes and a color page in six minutes. The receiving print locations — a mix of printing companies, Gannett and non-Gannett daily newspapers — transfer the transmitted data to printing plates, print the day's edition and distribute the paper throughout the region. "Without our satellite system, it would be impossible to produce the newspaper," Hider stated.

■

The 1.2 million copies of *USA Today* that are distributed to airports, hotels, street corners and households each

Continued on page 6

Intel to exit dynamic RAM chip mart

Company posts $3.6 million loss in third-quarter 1985

By Clinton Wilder

SANTA CLARA, Calif. — Intel Corp. last week announced that it lost $3.6 million in the third quarter ended Sept. 28 and that it will exit the hard-hit dynamic random-access memory (RAM) chip market.

Intel posted an operating loss of $22.9 million for the quarter, which was reduced by interest, sale of assets, other income and tax credits. Revenue dropped 28% compared with last year's third quarter, from $432 million to $312 million. The per-share loss was 3 cents, compared with a profit of 60 cents per share, or $70 million, in the year-earlier quarter.

Adding to the expected dismal news from Intel was the prediction from Gordon E. Moore, Intel's president and chief executive officer, that the fourth quarter will be even worse, despite s slight pickup in orders.

"Our employees are doing an excellent job of cutting costs," Moore said. "But we're finding it impossible to keep up with the decline in revenue brought on by falling prices and weakness in the computer industry demand."

Intel's third-quarter followed previous red-ink reports from fellow West Coast semiconductor leaders National Semiconductor Corp. and Advanced Micro Devices, Inc. The three firms recently joined together to call for import duties on erasable programmable read-only memory chips allegedly being sold below cost in the U.S. by eight Japanese vendors.

The anticipated fourth-quarter loss will cut further into Intel's meager earnings for the fiscal year, which stand at $16.5 million, or 14 cents per share, for the first nine months. In the first three quarters of 1984, Intel earned $175 million, or $1.50 per share. Revenue has slipped from $1.2 billion to $1 billion in the same period.

The company said its deepest losses came in memory chip products, of which dynamic RAM chips have been hardest hit by falling prices and Japanese competition. Dynamic RAM circuits have become a commodity item with little or no differentiation among vendors except in pricing, and Intel said such chips have accounted for less than 5% of the company's revenue this year. Intel currently makes only CMOS dynamic RAM chips, having discontinued earlier dynamic RAM technologies.

A spokeswoman said Intel would stop making dynamic RAM chips at its Oregon production facility by the end of March 1986 and will seek to transfer the 75 affected employees to other jobs in the company. Intel will continue to provide its dynamic RAM customers with products from alternative vendors, possibly including Japanese firms, she said.

"Prices just continue to weaken and weaken, and that has dragged down the prices of our value-added memory chips," she said.

Susan Scibetta, a memory chip market analyst for Dataquest, Inc. in San Jose, Calif., said Intel's departure from the dynamic RAM business was expected. "They have been trying for a while to focus their business much more on microprocessors, which is their forte," she said. "Even in the CMOS dynamic RAM market, pricing has just collapsed. Technically, [Intel is] very good, but it just can't be profitable at current price levels."

Chip maker plans holiday shutdown

By Clinton Wilder

SUNNYVALE, Calif. — Semiconductor manufacturer Advanced Micro Devices, Inc. announced last week that it will shut down nearly all of its U.S. operations for two weeks at the end of the year, requiring employees to take their vacations during that time.

The company, which recently reported its first-ever quarterly operating loss [CW, Sept. 23], said most of its 7,600 domestic employees will be asked to take six paid vacation days in conjunction with official company holidays on Christmas, Dec. 30-31 and New Year's Day. The Advanced Micro Devices facilities will be shut down from Dec. 23 to Jan. 5.

The company also said employees can borrow up to 10 mandatory vacation days against future accumulation of vacation time to lessen the possibility of having to take unpaid vacation time or furlough.

Most of the firm's domestic employees had already taken eight mandatory vacation days when the company shut its plants for two weeks early last summer in conjunction with the July 4 holiday period.

The move was the latest in a series of cost-cutting measures that the semiconductor vendor has taken to avoid personnel layoffs. Advanced Micro Devices reiterated its no-layoff policy in last week's announcement.

Other measures taken by the company have included a 10% pay cut for managers and other professionals, a 15% pay cut for the firm's top 100 executives, a freeze on hiring and wage increases and the elimination of nonessential expenditures.

The firm has dubbed its cost-cutting program Staunch, which stands for "Stress Those Actions Urgently Needed to Check Hemorrhaging."

Burroughs launches mid-range A 10

By Donna Raimondi

A mid-range entry into Burroughs Corp.'s A series of general-purpose mainframes made its debut late last week, along with an upgrade package for the A 9 system.

The newly announced A 10 system, using emitter-coupled logic circuitry, is available in single- and dual-processor models and falls between the A 9 system announced in January 1984 and the A 15 large-scale system released in March.

The A 10 appears to be targeted at the IBM 4381-size user, according to industry analyst Dave Moschella of International Data Corp. The A series has been a good performer for Burroughs, probably contributing to the fact that Burroughs has had a "decent" year in the middle of the computer industry slump, he said, although the company recently released a dismal earnings projection.

The single-processor Model A 10 F is said to offer a 12% performance improvement over the A 9 system, and it is field upgradable to the A 10 H. The unit costs $580,000 for a base system that includes 12M bytes of main memory.

The dual-processor A 10 H is basically two tightly coupled A 10 Fs and can be used as one system or partitioned into two single systems operating as independent A 10 Fs. This unit is available immediately with a price tag of $962,000 for a 24M-byte basic system.

Also released was the A 10 FXH upgrade package that allows A 9 F and A 9 FX users to upgrade their systems to A 10 H dual-processor machines.

News clues?

Hard as we try to give our readers the most complete information available, some good news and feature stories never reach us.

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NEWS SUMMARY

TURBO

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Arrange a test drive.

You say you've always had very simple tastes? All you ever wanted was the best?

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- **SYBACK – the world's fastest and most maneuverable backup, restore and copying program;**
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(1) TURBO PERFORMANCE: Have you ever stepped down on the gas in a dangerous driving situation and discovered . . . nothing? Well, that'll never happen to you with these two vehicles.

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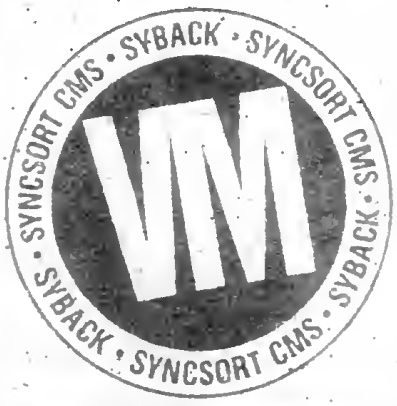

syncsort INC.

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From page 1

AT&T's PC 6300 Plus tops microcomputer lineup

up to 25% faster than the Personal Computer AT but uses a bus that is compatible with the XT, according to spokesmen for AT&T.

John Boyd, vice-president for sales of AT&T's Computer Systems division, told *Computerworld* that the system "will reinforce AT&T's position as a bridge within the computer business."

True concurrency is expected to occur during the first quarter of 1986, when AT&T releases software that enables the PC 6300 Plus to support an MS-DOS application as a task under Unix, with tight integration to the host operating system.

Commenting that AT&T must offer an AT-class machine to continue its offense in the personal computer market, industry analysts predicted that the PC 6300 Plus will be competitive but will not necessarily stand out among the flood of 80286-based systems.

Existing PC 6300s can be upgraded to the system, with a kit costing $2,995 available in December, AT&T emphasized. Colony, director of Forrester Research, Inc. in Cambridge, Mass., applauded the move, saying that "large users don't want to swap out their machines."

The PC 6300 Plus features a 6-MHz 80286 chip with zero-wait states and takes a 15-in.-square footprint (as opposed to the AT's 21- by 17-in. design). A base system comes with 512K bytes of internal memory (expandable to 1M byte on the motherboard and 7M bytes using expansion boards), 12-in. monochrome monitor with text and graphics modes, 84-key keyboard, serial and parallel ports, seven expansion slots, one 1.2M-byte floppy disk drive and one 360K-byte disk drive. MS-DOS 3.1 costs $65.

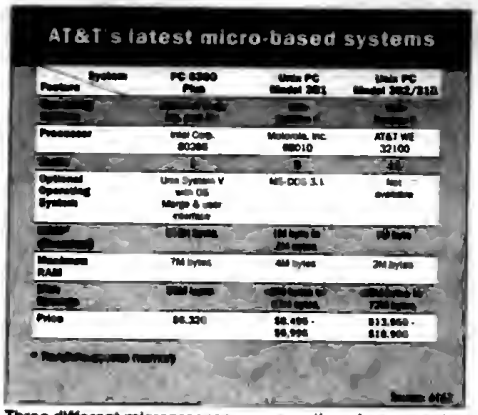
AT&T Unix System V and the OS Merge operating software will carry a $395 price tag. Although the PC 6300 Plus is expected to sell primarily as a single-user system, it will support up to three users under Unix.

An enhanced model that substitutes a 20M-byte hard disk drive for the 360K-byte floppy is priced at $6,320. AT&T does not currently offer options for additional internal storage, although larger disk systems will be introduced next year. Another route is to buy standard IBM-compatible external storage devices, the company noted.

As expected, AT&T last week also introduced another bridge between Unix and MS-DOS in the form of an MS-DOS coprocessor for the Unix PC. Additionally, high-end Unix PC models with additional hard-disk storage and internal memory were unveiled, along with 26 software programs and other options (see story page 5).

AT&T's new 3B2/310 supermicro, supporting up to 14 users, also debuted, as did several enhancements to the 3B2 line (see story page 5). The Personal Terminal 510A is an analog version of the Personal Terminal, which AT&T introduced last March for digital voice/data switches and which has been renamed the 510D. Like the original model, the 510A features a touch-screen two-line telephone, directory dialer for voice and data, a Digital Equipment Corp. VT100-compatible terminal, modem, autodialer, speakerphone, calculator and time manager. The system is available now for $1,545.

Finally, AT&T introduced the first printers that it has built internally for the small systems market. Available immediately, the dot matrix printers were designed for use with the PC 6300 and PC 6300 Plus, Unix PC, 3B2s and the IBM Personal Computer and compatible systems, the vendor said. They operate at 200 char./sec. in draft mode and 50 char./sec. in near-letter-quality mode. The Model 478, with 9½-in. platen, costs $1,095, while the Model 479, with 15-in. platen, is priced at $1,295, AT&T said.



Three different microprocessors power the microcomputer systems released last week by AT&T, ranging from the 16-bit Intel Corp. 80286 to the 32-bit AT&T WE 32100.

Analysts downplay 6300 Plus' Unix ability

By Eric Bender and Peggy Watt

The ability to blend concurrently Microsoft Corp. MS-DOS and AT&T Unix applications on the AT&T PC 6300 Plus is a significant technical accomplishment, but observers are divided on the value of that ability in the corporate market.

"AT&T is pushing Unix no matter what," said Aaron Goldberg of International Data Corp. in Framingham, Mass. In the marketplace targeted by the machine, though, "Unix is not a factor," he maintained.

At least initially, the system will sell primarily as an IBM Personal Computer AT-compatible product based on its faster speed, analysts pointed out; AT&T said the product actually uses a bus that is compatible with the IBM Personal Computer XT. And while some who had seen the machine generally commented favorably on its performance, they suggested that the PC 6300 Plus lacks features to strongly distinguish it from the many AT-compatibles already introduced.

With a glut of ATs and compatible systems on the market, "there's rough sledding ahead for any AT clones," according to George Colony of Forrester Research, Inc. in Cambridge, Mass. Corporate users are proving unwilling to accept the additional costs for the high-end machines, he said. However, he added, vendors "have to have an AT to be in the market today."

"It makes all the sense in the world" for AT&T to introduce an IBM Personal Computer AT-compatible system," agreed William Ablondi, vice-president for markets at Future Computing, Inc. in Dallas. As did other industry analysts, he noted that AT&T's intentions to become a very broad-scale vendor of computer products required that move.

AT&T keeps "putting solutions out and is going to hit on some success formulas," said analyst Jeffrey Stone of Menlo Park, Calif.

AT&T successfully has established some beachheads in corporate America for its numerous personal computer products, the analysts pointed out. Forrester surveys indicate that AT&T is in fourth place

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Unix PC enhancements include MS-DOS coprocessor

By Eric Bender

NEW YORK — AT&T last week boosted its beleagured Unix PC desktop with a coprocessor running Microsoft Corp.'s MS-DOS, new models offering higher storage and internal memory capabilities, a flurry of software packages and other enhancements.

The coprocessor board for the expanded Unix PC line, the DOS-73, features an 8-MHz Intel Corp. 8086-2 chip with 512K bytes of internal memory, an RS-232 port and a socket for an Intel 8087 numeric coprocessor. The board runs under MS-DOS 3.1 and runs most IBM Personal Computer software in a window that runs concurrently with other applications windows. DOS-73 will be available next month for $995. An 8087 coprocessor also will be offered for $295.

The Unix PC Model 3B1 introduced last week is aimed at multiuser applications. It is based on a 10-MHz Motorola, Inc. 68010 chip and runs Unix System V Version 3. Three configurations were announced, all scheduled for delivery next month and including a 320K-byte floppy disk drive, mouse, 300/1,200 bit/sec. modem, monitor and keyboard. A configuration with 1M byte of random-access memory (RAM) and a 40M-byte hard disk drive costs $8,495, a version with 2M bytes of RAM and 40M bytes of storage is priced at $8,995, and a system with 2M bytes of RAM and 67M bytes of storage costs $9,995.

AT&T also announced upgrades to the existing Unix PC Model 7300. A 20M-byte upgrade kit costs $975 and is available now. A 40M-byte upgrade kit sells for $3,495, and a 67M-byte kit is priced at $3,995. Both will be offered next month.

Among the other options are a $1,995 23M-byte external streaming tape backup unit, available in November, and a 2M-byte RAM expansion board, priced at $1,795 and available now.

An IBM 3270 Systems Network Architecture emulator software package for the PC Unix line will be offered in first-quarter 1986 for $795, AT&T said.

The 26 new Unix PC software packages, most of them shipping now, boosts the total of Unix PC packages to 54 programs available from AT&T and 160 packages overall, the company said. Among the introductions are Ryan-McFarland Corp.'s RM/Fortran and Language Processors, Inc.'s LPI/Fortran, each priced at $795; Micro Focus, Inc.'s Level II Cobol and Cobol Runtime, which cost $1,195 and $295, respectively; Relational Database Systems, Inc.'s Informix and Informix Runtime, which cost $895 and $395; and Micropro International Corp.'s Wordstar 2000, which is priced at $495.

Unix-based 3B2/310 out

AT&T Information Systems repackaged most of its AT&T Unix-based 3B2/400 supermicrocomputer in a smaller box for its introduction of the 3B2/310 last week.

It was an announcement that received a lukewarm response from several analysts, who concluded that it was an average upgrade from the existing 3B2/300. Designed for simultaneous support of six to 14 users, depending upon the application, the 3B2/310 is based on the same 32-bit, 10-MHz microprocessor that is included in the WE32100, AT&T's 25-user 3B2/400.

AT&T claimed that the 3B2/310 offers processing power close to that of the 3B2/400. The 3B2/310 is targeted at scientific, engineering and business graphics applications involving departmental computing where work groups share files. It offers an optional WE32106 math acceleration unit that AT&T said produced a benchmark of more than 200K double-precision C language whetstones per second.

Users with 3B2/300 systems, which support a maximum of 10 users, can migrate to the 3B2/310 with a field-upgrade kit priced at $2,500 including installation. AT&T also said the 3B2/310 is source-code compatible with all computers based on AT&T Unix System V and object-code compatible with the 3B2/300, 3B2/400 and with its 3B5 and 3B15 superminicomputers.

The basic 3B2/310 includes 1M byte of main memory with two expansion slots for expansion to 2M bytes, two RS-232C ports controlled by the system board, four RS-232C ports and one parallel port controlled by an I/O expansion port card and four feature card expansion slots.

The base system with a 30M-byte hard disk and one I/O card costs $13,950 and is available now. The basic system with the math acceleration unit costs $15,550, and the system with a 72M-byte hard disk and math acceleration unit costs $18,900. The field-upgrade kit will be available in November. A 23M-byte cartridge tape unit for hard disk backup will be available in December for $2,595.

— James Connolly

From page 1

'USA Today': Satellite network delivers daily

weekday carry the stamp of a number of Gannett employees. Some stories come from Gannett's news wire, which is fed by the reporting and editing staffs of 85 Gannett newspapers and six television stations. Material not gleaned from the news wire is generated by the 400 editors and reporters who work exclusively for *USA Today*.

These reporters, and their editors, process copy on systems provided by Atex, Inc. of Bedford, Mass., a leading vendor of publication word processing systems. The news staff works with 400 terminals attached to 16 Atex systems, which are based on PDP-11 minicomputers from Digital Equipment Corp.

When editors complete work on a story, the story is transmitted electronically to a typesetting machine. News and advertising copy are then pasted up by designers, proofread and taken to a camera department. There, the pasted-up pages are transformed into black-and-white or color-page prints by cameras the size of compact automobiles, from Chemco of Glen Cove, N.Y.

Next, the prints are placed on Ricoh Corp. K660 facsimile scanners, which digitize the images. A Ricoh data compression device transforms the images that would normally require a 1.54M bit/sec. T1 line, so they only need one 160K bit/sec. channel. The compressors are connected to the 7-meter rooftop dish. From the Arlington headquarters, 48 pages of news and feature material are sent to 31 printing locations and, ultimately, to readers throughout the country.

■

Not that the *USA Today* transmission system is bulletproof. Because its function is so critical, the system includes a number of backup features. Along with each page shipped, for example, a one-way voice message informs the various printing locations of what is coming. A multidrop private line network from AT&T equipped with Codex Corp. modems allows one or more of the sites to contact Arlington in case of a failure. "If one site is having problems, we can take it off the network, troubleshoot the line and later retransmit the data," Hider said.

Another emergency concern, breakdown of the transmitting satellite dish, is addressed through the presence of a T1 line connecting the central site with a backup satellite broadcasting facility approximately 10 miles away in Springfield, Va. Should lightning or worse strike the central sending satellite, the backup unit could transmit pages to the Westar III satellite.

■

Transmission of a given day's worth of *USA Today* news and advertising materials is virtually a round-the-clock affair. From 6 a.m. to noon EST, technicians send test pages to a receiving dish at the Arlington headquarters. The tests ensure that the central site's scanner equipment is calibrated.

Following calibration of the central site equipment, receiving site equipment has to be set. Test pages are broadcast from Arlington to the various printing sites between 1 p.m. and 2 p.m. EST. To ensure that a certain red tint in the Los Angeles edition mirrors that in the New York edition, individual technicians set their plants' receiving equipment so that the red tints at the 31 plants fall within a 4% range.

Once testing is completed, Arlington begins sending the day's material. Each of the paper's four sections is transmitted so that the first U.S. edition is completed by midnight EST, the second by 1:30 a.m. and the third by 3:30 a.m. Also during the day, a European and Middle East edition, consisting of two rather than four sections, is sent to a printing plant in Western New York, from which it is flown to JFK International Airport for a trip to London for overseas distribution.

> *'Without our satellite system, it would be impossible to produce the newspaper.'*
>
> — William O. Hider
> *USA Today*

When the *USA Today* system was designed in 1981, the required technologies were relatively new. In the bidding among prospective vendors, American Satellite beat out RCA American Communications, Inc. and Western Union largely because American Satellite had supplied Dow Jones & Co. with a similar net for printing *The Wall Street Journal*.

Now, Hider claimed in a recent interview, the *USA Today* process has surpassed that of the *Journal*'s 20-site network. However, the *USA Today* system may be eclipsed next year when Federal Express Corp. is set to complete a proposed 25,000-site satellite system.

Even with the cost of traditional communications systems falling, Hider maintains that *USA Today*'s satellite system is more cost-effective than terrestrial systems. He estimated that a terrestrial system would cost the newspaper $700,000 per month compared with its current $300,000 monthly outlay. He added that the satellite system error rates are twice as low as comparable terrestrial services. "When fiber-optic lines are installed, terrestrial transmission will become cheaper and more reliable; then we may look at it," he said.

Right-of-ways often complicate implementation of a satellite network. "Most companies do not know who to contact for right-of-way approval," he said. "We became very good at identifying the proper municipal department to contact."

■

Savings are a critical factor at *USA Today*, as the newspaper has run at a deficit since its inception and no profits are expected until 1987. Meanwhile, daily page totals have risen from 40 to a current average of 48, with an increase to 56 planned by the end of this year.

To keep up with this growth, Hider plans to add telecommunications staff and printing plants. Currently, Hider stated, 70% of the country receives the paper on the day that it is printed; the addition of other printing locations should bring this figure close to the 100% mark.

Future plans also call for a weekend edition and for a European edition. Earlier this month, an Asian edition was launched. R&R Donnelley & Sons Co. is overseeing the edition's transmission. The Asian edition is sent from Arlington to New York by a land line. Then, it is relayed by international satellites first to London, then over the Indian Ocean. A receive station in Singapore is the final destination for the data. When readers in the Far East sit down to breakfast with a fresh, multicolored edition of *USA Today* before them, they can whisper a quiet thanks to William O. Hider.

From page 4

Analysts downplay 6300 Plus' Unix ability

among micro suppliers in the Fortune 1,000 market, Colony said. He and Goldberg both estimated that AT&T will ship 110,000 personal computers overall this year. However, very few of those will be Unix PCs, analysts said, with estimates ranging downward from 15,000.

Some analysts saw the systems as a boost for Unix and the software developer who hopes AT&T's implementation is just one of many.

Locus Computing Corp. of Santa Monica, Calif., developed the OS Merge system to enable AT&T's PC 6300 to run MS-DOS and Unix concurrently and retained rights to the technology to market it to other manufacturers. The company declined to name any potential customers but said several are in the offing, both for new machines and as upgrades to models already on the market.

Dave Butterfield, Locus systems development manager, said the plug-in card that converts the AT&T Unix PC into a Unix/MS-DOS combination machine works with most systems with Intel Corp. processors. He said Locus is also looking to install OS Merge on a machine with an Intel coprocessor. He calls OS Merge an "operating environment."

Mindcraft, Inc. analyst Bruce Weinger, from Palo Alto, Calif., said he would like to get an IBM AT running Unix on his own desk.

"[AT&T has] positioned the 6300 as a single-user machine. I think people will buy it as a powerful [MS-DOS] machine, and Unix will get in the back way," Weinger said.

"Any good operating system is one you aren't aware of," said Brian Boyle, director of research for Novon Research Corp. of San Francisco, pointing to the "hidden" Unix in the PC 6300 Plus. He named networking capabilities as its most attractive potential.

"There are those who say they don't want Unix. [AT&T] put this together so [it] can say, 'What do you want? [MS-DOS?] Fine, now you've got it — in the same box with Unix,' " Boyle said.

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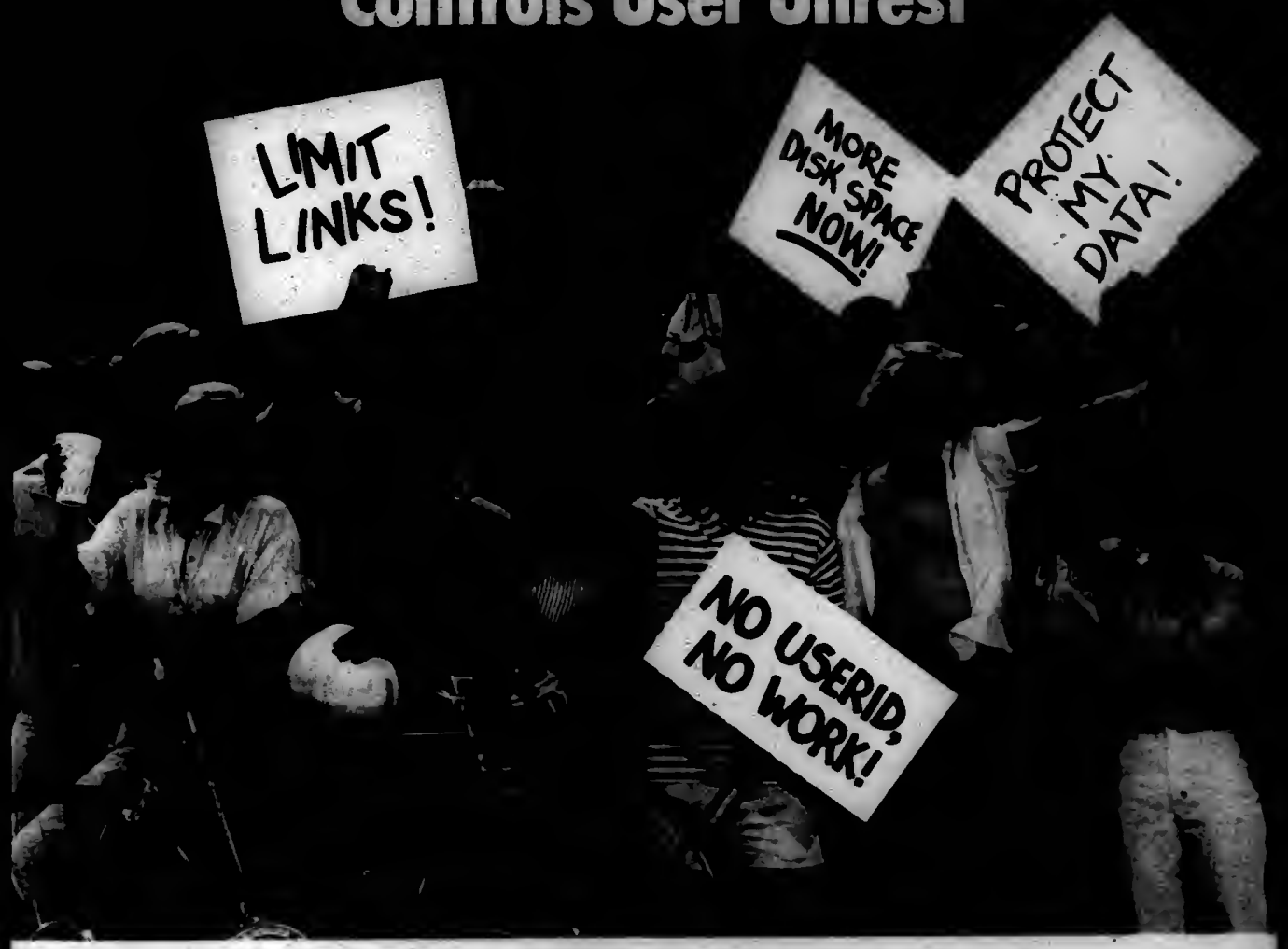

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From page 1

Users tie snags to Ideal, DBMS

formed as expected in a production environment and suggested that any performance problems they encountered were the result of predictable processing bottlenecks in working with the indirect access methods of relational DBMS.

Comments from the commercial users ranged from, "Ideal did everything ADR said it would [do]," to, "We're getting close to turning the power on, and we're running into all kinds of performance problems." Some glitches appeared to be limited to a particular site, but several were common to a sample group of nine users contacted by *Computerworld*. All were users of Ideal and Datacom/DB, the ADR relational DBMS.

From the ontset of the New Jersey Department of Motor Vehicles' controversy, ADR officials have maintained that they lack sufficient knowledge of that particular system's design to comment on the specific problems. They are cooperating with the state to resolve the matter.

The accounting firm of Price Waterhouse & Co., awarded the contract on a noncompetitive basis in November 1983, turned to Ideal and Datacom/DB last year to develop a new system for the New Jersey Department of Motor Vehicles. When the full system was implemented in July, operating on a National Advanced Systems Corp. 8083, it ran too slowly to make the required updates. A backlog of 1.4 million registration renewals built up, and, as a result, police departments around the state were ordered to stop citing motorists for expired registrations.

Price Waterhouse, on the advice of its attorneys, refused to appear at a hearing before a state Assembly committee Oct. 3 to explore the causes of the backlog. The firm is subject to extensive contract penalties amounting to $50,000 a month beginning in October for late delivery of the completed system.

Price Waterhouse spokesmen did appear at a New Jersey Assembly hearing last Tuesday, Oct. 8, to which they had been subpoenaed, and acknowledged buying $15,000 in tickets to a fund-raising dinner for New Jersey Gov. Thomas Kean in September 1983. The contribution was made shortly after the state exempted the firm in July 1983 from competitive bidding for the $6.5 million Department of Motor Vehicles contract. They did not address the specifics of the department's backlog problems, however.

Although declining to comment on the specific performance problems at the New Jersey Department of Motor Vehicles, Joseph W. Farrelly, vice-president for research and development with ADR, said Price Waterhouse used Ideal to develop the state system because Price Waterhouse "faced time constraints" and wanted to avoid paying contract penalties. Farrelly said the high-volume processing requirements should have been written in Cobol, although last December, ADR told *Computerworld* that Ideal is a functional replacement for Cobol.

> *Comments from users ranged from, 'Ideal did everything ADR said it would [do],' to, 'We're running into all kinds of performance problems.'*

Commercial users, however, were able to point to several features of the fourth-generation language and Datacom/DB that could have led to the severe performance problems in a multiuser production environment.

Ideal shields the user from knowing whether a query to the relational DBMS is using established keys or if the query is forcing the system to determine its own access path, according to Jo Ruspici, systems analyst at Columbia Pictures in Burbank, Calif., which uses Ideal and Datacom/DB to keep track of its motion picture and television show inventory.

If multiple users ask the system to derive its own access method, "they could be doing flat file searches without knowing it," agreed ADR's Richard Kauffman, vice-president of the applications development product group.

A flat file search, or population count, forces the computer to go through all indexes to the data base and build a new one containing the locations of the searched-for elements. Control of this procedure is passed from Ideal and Datacom/DB to what the users referred to as "the black box," the DBMS' Compound Boolean Selection facility, which determines the statistically most efficient method of retrieving the data, the users said.

If someone was looking for Texas males in a data base, for example, Compound Boolean Selection would conduct a population count and determine that there was data on 100,000 males but only 50,000 Texans, so the quickest way to retrieve the information is to begin indexiog Texans, said Byron L. Griffin, manager of the information center at Diamond Shamrock Refining and Marketing Co. in San Antonio.

This procedure is time consuming, however. "It takes 3½ hours to read all the indexes in our data base. I stay away from it," said Columbia's Ruspici, whose data base contains 7 million records.

This feature was the one area where ADR officials said they knew of a connection between their products and the Department of Motor Vehicles' slowdown. When questioned on the point, Kauffman said, "Yes, I think that is the case, but I'm not so sure we want to comment further on the point."

Ruspici and other users also warned about creating too many keys for access to data in Datacom/DB. Columbia Pictures has limited itself to 14 keys after a trial-and-error method of encountering slowdowns when it tried to use more. It takes two hours to update 2,500 records a day in the 7-million-record data base, she said.

ADR's Kauffman also urged users to limit the creation of keys. "If you define everything in the data base as a key, your index is going to be larger than your data base," he said.

But other users said they had yet to reach the slowdown stage with as many as 32 keys. Israel E. Gotay, data base administrator for the U.S. Federal Energy Commission in Washington, D.C., said its Datacom/DB data base of 40,000 records of 4,000 bytes each was running smoothly on its IBM 4341 processor. It handles up to 10,000 transactions a day.

Spencer Dockins of Northern Telecom, Inc. said Ideal has a subprogram calling feature that introduces an element of unpredictability in how subprograms run after their first call.

The feature was designed to free CICS resources periodically by storing called subprograms after they have been run, although on some calls the subprogram may still be resident in the computer memory. If the initials or data values in the subprogram were changed by the run, and the subprogram had not been stored, a subsequent call would employ the changed values rather than use a fresh version, he said.

ADR's Kauffman said multiple users of Version 1.1 of Ideal, released 15 months ago, ran the risk of getting a run version of the subprogram before it had been released from memory. Version 1.2, released at the end of August, corrected the problem, and other users have found ways to eliminate the uncertainty in 1.1 through command structures in the subprogram.

Kauffman said he did not believe the release feature had contributed to problems at the Department of Motor Vehicles. At one point a junior technical advisor at ADR had urged Price Waterhouse to employ the feature, but his recommendation was countermanded the same day by ADR product specialists, he said.

The department has been plagued by unpredictable output along with its entry backlog. When municipalities were asked to check on the registration of their vehicles, police cars at scattered locations were registered with the correct license number, department and street address but with the wrong town. The department has also beeo plagued by automatic registration renewal mailings going to drivers at their home address but at the wrong time of year.

Kauffman said he did not know enough about Price Waterhouse's implementation to say what caused the problems. The department has received Version 1.2 for development [illegible] but is still using Version 1.1 for production purposes, he said.

Diamond Shamrock's Griffin said subprograms are automatically paged out to storage if they are not automatically released by Ideal at his installation. He has also taught his programming staff to avoid Compound Boolean Selection and said his firm's sophistication in using Ideal and Datacom/DB stems from meetings of the Houston Users Group, which has frequently hosted top ADR technical spokesmen.

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San Jose	11-5-85	●	●	●	●	●
COLORADO						
Denver	11-12-85	●	●	●	●	●
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Hartford	11-19-85	●	●	●	●	●
DISTRICT OF COLUMBIA						
Washington D.C.	11-26-85	●	●	●	●	●
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Jacksonville	11-20-85	●				
Tallahassee	12-5-85	●				
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GEORGIA						
Atlanta	12-11-85	●	●	●	●	●
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Indianapolis	12-11-85	●	●	●	●	●
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Portland	10-16-85	●				
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Minneapolis	12-12-85	●	●	●		
MISSISSIPPI						
Jackson	11-5-85	●	●	●		
MISSOURI						
Kansas City	12-13-85	●	●			
NEBRASKA						
Omaha	12-9-85	●	●	●	●	●
NEW JERSEY						
Princeton	11-15-85	●	●	●	●	●
NEW MEXICO						
Albuquerque	10-15-85	●				
NEW YORK						
Albany	11-7-85	●				
New York	11-7-85	●	●	●	●	●
Rochester	10-24-85	●	●	●	●	●
Syracuse	12-12-85	●				
NORTH CAROLINA						
Charlotte	12-10-85	●	●	●	●	●
OHIO						
Columbus	12-12-85	●	●	●	●	●
OKLAHOMA						
Oklahoma City	12-3-85	●	●	●	●	●
PENNSYLVANIA						
Philadelphia	11-21-85	●	●	●	●	●
Pittsburgh	10-15-85	●	●	●	●	●
RHODE ISLAND						
Providence	11-6-85	●				
SOUTH CAROLINA						
Charleston	11-26-85	●	●	●		
Columbia	11-7-85	●	●	●	●	●
TENNESSEE						
Chattanooga	12-18-85	●	●			
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Nixdorf offers IBM-compatible 8890 version for offices

Beefs up system's multitasking support

By James Connolly

WALTHAM, Mass. — Nixdorf Computer Corp. will announce today that it is moving its IBM-compatible mainframes into the office environment in addition to improving the systems' multitasking support and communications capabilities.

The 8890 Compact series is largely an enhancement of the existing 8890 line that competes with the IBM 4331 class of systems. The product introduction focuses on the size of the three new 8890 models — Models 32C, 52C and 72C — which are said to be 50% smaller than the previously installed Models 32, 52 and 72 while offering the same processing speed, which ranges from .25 to .7 million instructions per second.

Nixdorf officials said the compact series is suitable for the office environment, running on 110V with no need for special environmental conditions. Nixdorf, which has installed 750 8890 series systems, said it is discontinuing one of the two earlier models designed to run in the office — the low-end 8890 Model 12 — but will continue production of the 8890 communications processor, a front-end processor installed in the office. All 8890 deliveries beginning in the first quarter of 1986 will be the compact versions.

Nixdorf enhancements in the 8890 series included improved multitasking and peripheral support capabilities for its Nidos/VSE operating system. The Nidos/VSE enhancements include an Auto Priority Balancing scheme for handling concurrent tasks and improved system file recovery and restore capabilities, Nixdorf said. Also included in the announcement is Version 2 of Nixdorf VSAM, full support of IBM 3370 disk-drive capacities and enhanced locking options for file security.

Communications capabilities announced include the ability of all models in the 8890 system to support the maximum six I/O channels and an increase in the speed of those channels from 1.8M bit/sec. to 2.2M bit/sec. Nixdorf also said all systems, regardless of the model, will be able to support the maximum 256 terminals, four printers, 16 communications lines and 20 tape drives.

The company said an integrated communications adapter provides communications speeds of up to 66K bit/sec., three times the previous 19.2K bit/sec. rate.

Nixdorf's 8330 and 8370 disk-drive lines also are being enhanced with the addition of double-density versions, increasing the capacity of the previous 100M-byte drive to 200M bytes and the 129M-byte drive to 260M bytes.

The 8890 series is targeted at the general-purpose DP market, dedicated single-purpose applications, computer-aided design and manufacturing applications and distributed DP for the office.

A typical configuration for the 8890 Model 32C with 1M byte of memory, a 260M-byte disk drive, a streaming tape drive, a 300 line/min printer, four terminals and a four-line communications adapter costs $91,500.

The typical mid-range Model 52C includes 2M bytes of main memory, 1.2G bytes of disk storage, two high-density tape drives, a 600 line/min printer, 10 terminals and a four-line communications adapter. It costs $150,000.

At the high end, the typical Model 72C includes 4M bytes of memory, 2.5G bytes of disk storage, two high-density tape drives, two 600 line/min printers, 15 terminals and a four-line communications adapter. It costs $250,000.

Nixdorf also is announcing that two value-added resellers will market turnkey systems based on the 8890 using the Pick Systems' Pick operating system. Those resellers are Database Solutions, Inc. of Houston and Tiger Computer Corp. of Costa Mesa, Calif. Nixdorf said it also plans to offer the Pick operating system on its other product lines.

Tandem exec to join Arete

CUPERTINO, Calif. — One of Tandem Computers, Inc.'s most senior executives resigned last week to join Arete Systems Corp., a San Jose, Calif., manufacturer of microprocessor-based departmental systems.

David R. Mackie, vice-president of U.S. marketing for Tandem, resigned effective Oct. 15 to assume a marketing position with Arete. Mackie joined Tandem two months after the company, which manufactures fault-tolerant, transaction processing systems, was founded in November 1974. A company spokesman said Mackie's departure was "cordial on both parts."

Mackie's domestic marketing responsibilities will be assumed by Gerald L. Peterson, Tandem's vice-president for international marketing.

— James Connolly

Continued from page 1

earnings-per-share estimate for the quarter, but that was still below IBM's $2.65 per-share mark in the same period last year.

"Nothing has happened recently to change what I've said before," Weil said last week. "This is based on everything we've heard from [IBM] about 3090 shipments not making any impact until the fourth quarter."

■

An era is coming to an end. And a new one is about to begin. According to reliable sources, IBM will announce Tuesday at least portions of its fabled local network, bringing to a halt one of the communications industry's favorite pastimes, speculation about Big Blue's local-area network plans. Welcome a new era of interpretation, rumination and probably further speculation about the consequences.

■

Amid the parade of IBM Personal Computer AT look-alikes, Future Computing, Inc. last week said it expects sales of AT compatibles to grow from 94,000 units this year to 342,000 next year. IBM, meanwhile, will sell 292,000 units of the original this year and 568,000 next year. Future Computing stressed, however, that is was only including "operationally compatible" machines. Future Computing said Hewlett-Packard's Vectra is operationally compatible with the AT, but AT&T's PC 6300 Plus (see story page 1) and ITT's Xtra PC are operationally compatible with the Personal Computer XT.

■

Cullinet Software told the estimated 4,000 attendees at its ninth annual User Week in Boston last week that it has completed delivery of its manufacturing information system. The final two modules — purchasing and cost control — of its eight-module integrated manufacturing applications line were released for beta test in September, Cullinet President Robert Goldman said. Goldman also promised that Cullinet would complete its finance product line with a December beta release of an accounts receivable module.

■

At ADAPSO's fall meeting in Washington, D.C., last week, a source within Contel Information Systems, Inc. told *Computerworld* that the subsidiary's parent company, Continental Telecom, Inc., plans to divest itself of two of its other subsidiaries — Austin, Texas-based Execucom Systems Corp. and STSC, Inc. of Rockville, Md. A Continental Telecom spokesman would neither confirm nor deny the allegation. According to the spokesman, the company would reveal its plans for the two software and services holdings when it releases its third-quarter earnings report later this month.

■

An item that would not have made news last year, made headlines last week: Wang Laboratories is making money. The Lowell, Mass., office automation leader said it will show a profit for the first quarter ended Sept. 30 as well as a revenue increase over last year's $553.8 million in the comparable quarter. Wang may not match its first-quarter 1984 profit of $51.2 million, but its in-the-black finish this time is a decisive turnaround from the disastrous $109 million loss it posted in the quarter ended June 30.

From page 1

FBI probes software program piracy claim

The FBI received a tip "within the last 30 days" regarding the alleged Versacomp piracy from a former DP manager at the institute, Joseph Gosseaux, supervisory special agent for the FBI, told *Computerworld* last week; he declined to elaborate.

The Institute of Scientific Information had apparently "provided Garner a copy of the Versacomp program, which Ralph Garner Associates had been using for commercial purposes," according to Gosseaux. He said that Micropro had "apparently authorized five copies [of Wordstar] to the institute, and we determined that far many more copies were made for commercial use outside the agreement with Micropro."

Attempts by *Computerworld* to contact Micropro were unsuccessful.

In its suit, Pagetec requested an injunction to stop the institute and Ralph Garner Associates from continuing to run Versacomp. A preliminary hearing was held in U.S. District Court in Philadelphia last week in which judicial action on the restraining order was postponed until a further hearing scheduled for Nov. 13, according to an attorney who asked not to be identified.

The FBI is continuing its investigation of the institute and Ralph Garner for "violations of copyright statutes under Title 17 of the Federal Rules of Criminal Procedure" and for "interstate transportation of stolen property," Gosseaux said.

Both companies were apparently running the program in an IBM 4331 environment, according to James Hutchison, president of One For One, Inc., an Atlanta-based marketing arm of Pagetec. Hutchison said the institute had purchased Versacomp from One For One about four years ago.

Hutchison said he knew of at least one other incident in which Versacomp had been pirated. "It was a company that had two different locations with MIS operations, and the software was copied in order to save them from buying a second program," he added. As a result, Hutchison said, legal action resulted in "the company just getting a slap on the hand." He declined to identify the company.

Attorneys for the Institute of Scientific Information told *Computerworld* the firm would not comment on the pending lawsuits or investigation. Spokesmen for Ralph Garner Associates also declined to comment.

Honeywell launches DISOSS-compatible software

Debuts point up shift to IBM coexistence

By John Dix

BILLERICA, Mass. — Taking its second step in as many weeks to coexist with IBM, Honeywell, Inc. last week unveiled a software link to IBM's document handling facilities and two IBM-compatible desktop microcomputers.

Included in the second barrel of the company's product blast was a multiuser supermicrocomputer. The announcement came a week after Honeywell revamped its network architecture to provide increased communications options, including terminal links to IBM hosts [CW, Oct. 7].

Following in the footsteps of competitors Digital Equipment Corp. and Data General Corp., Honeywell pledged compatibility to IBM's Distributed Office Support System (DISOSS), the mainframe maker's document management system.

Honeywell's solution is Docu-Link, a software program for its Microsystem 6/10 and DPS 6 minicomputers. Prerequisites for Docu-Link — part of Honeywell's Office Automation System Facility — include Release 1.2 of Honeywell's SNA Transport and Release 1.2 of its interactive terminal facility. Docu-Link must be complemented on the host side by Docupower, a software product from Software Research Corp. in Natick, Mass., that provides the actual DISOSS interface.

Docu-Link enables users to exchange revisable form documents with IBM environments and take advantage of DISOSS library and distribution services, according to Charles Ross, director of Honeywell's office management systems division.

Ross said implementing the DISOSS link through software is less expensive and more flexible than using a dedicated processor as a gateway. Docu-Link enables users to connect directly with IBM Systems Network Architecture (SNA) environments and obviates the need to support Honeywell's network architecture at each node, Ross explained.

Scheduled to be available in December 1986, initial license fees for Docu-Link will cost $525 for Microsystem 6/10 systems and range in price from $2,650 to $4,850 for different models of the DPS 6 product line.

On the hardware side of the house, Honeywell unveiled two members of its new family of personal computers, the Honeywell Extended Processor (XP) and Advanced Processor (AP).

While equivalent to the IBM Personal Computer XT and AT, respectively, Honeywell's XP is said to offer a 67% speed advantage over the Personal Computer XT, while the AP has a 33% advantage over the equivalent IBM machine, Honeywell said.

Increased speed due to microprocessors

The differences in speed are attributed to microprocessor ratings. The XP uses an Intel Corp. 8088-2, a dual-speed microprocessor that operates at the 4.7-MHz level of the Personal Computer XT, but can be switched to run at 8 MHz. Maximum internal memory is 640K bytes and 50M bytes of storage.

The AP uses the same microprocessor as the Personal Computer AT, the Intel 80286, but at 8 MHz instead of the 6 MHz that IBM uses. Unlike the XP, the AP's 8-MHz chip cannot be slowed to match the IBM product. According to David Booth, Honeywell's director of personal computer product line programs, during "extensive testing" of IBM software the only difficulty encountered on the AP was with a single game program. He said a switch to slow the AP to 6 MHz will be included in an upcoming version of the machine. The AP has a maximum internal memory of 4M bytes and up to 80M bytes of disk.

The XT and AP are priced starting at $2,495 and $3,785, respectively, and will be available from the Honeywell direct sales force in November.

Terminal emulation support added

Honeywell also announced that it has added support of synchronous terminal emulation software to its Microsystem VIP Emulation software. This will enable the XP, AP and IBM XT and AT to emulate Honeywell's family of VIP7300 or VIP7800 terminals when connected to any model of the DPS 6 family. The software and documentation has an initial license fee of $400 and will be available in November.

The OMS 22 supermicrocomputer comes with 1.75M bytes of internal memory, 68M bytes of disk storage, an integral 5¼-in. diskette drive and a 64M-byte cartridge tape backup system. It runs the GCOS 6 Mod 400 operating system and includes software for document transfer, asynchronous communications and word processing. Prices for the OMS 22 start at $24,630.

The Honeywell Time Management Facility software package reportedly provides managers with calendaring functions including a daily "things to do" list. It is priced at $1,650.

Contributing to this report was Computerworld *International Editor Edward Warner.*

Big Eight MIS services facing congressional scrutiny

By Bryan Wilkins

WASHINGTON, D.C. — The nation's Big Eight accounting firms, which derive, on the average, one-third of their revenues from selling MIS and systems integration services, are facing increasing scrutiny from the U.S. Congress.

The congressional interest has developed in response to recent banking failures that have affected investors across the country. Some of these bank failures have reportedly involved computer systems recommended by the accounting firms that also independently audit those banks' books, as required by law.

The computer services industry has for many years raised its own questions about the fair trade issue involved when a certified public accounting firm sells computer services to a firm that it also is auditing. The industry has warned of potential conflicts of interest in which CPA firms provide both independent audits and computer advisory services.

Last week, at a management conference of the Association of Data Processing Service Organizations, Inc. (ADAPSO), Dave Williams, leader of the association's CPA Relations Committee, reported that the U.S. House of Representatives' Subcommittee on Oversight and Investigations has turned up the heat in the debate. The subcommittee sent detailed requests to the top 16 CPA firms in the U.S. asking for specific information about their nonaudit businesses and for the names of companies that are making use of both computer advisory services and independent auditing services from the same accounting firm.

'No smoking gun uncovered'

"So far, no smoking gun has been uncovered" from the responses received by the subcommittee, Williams said. Those responses were due Sept. 30.

Jack Chesson, counsel for the congressional subcommittee, told the ADAPSO session that subcommittee Chairman Jonathan Dingell (D-Mich.) "is very interested in this issue because he is very concerned about the audit independence of these firms responsible for overseeing the books of companies."

Chesson pointed out the collapse of Drysdale Government Securities, a trading arm of a California bank that used a computerized financial management system recommended by the same Big Eight accounting firm that performed its audit. "Within four months after the system was set up, Drysdale collapsed, and our investigation showed that it was bankrupt from the day it opened," Chesson said.

Chesson also said that the Big Eight accounting firms have not sent in the detailed information requested by the subcommittee. He predicted that Dingell will hold follow-up hearings. The initial hearings were held last March.

SEC not concerned

Chesson said that the Securities & Exchange Commission (SEC) has not indicated that it is concerned with the audit independence of accounting firms that are also performing MIS consulting and management services. The SEC regulates the financial reportings of publicly traded companies that are required to include the independent audit with their annual filings.

> ***"The computer services industry has warned of potential conflicts of interest in which CPA firms provide both independent audits and computer advisory services to a company."***

"The Big Eight firms and the accounting industry in general are saying that the two businesses are kept separate and ask, 'Why do we have to prove they are independent?' " Chesson said.

The computer services industry has held up as an example of its concern the contract awarded by the SEC to the accounting firm Arthur Andersen & Co. for the installation of an electronic document filing system. Companies regulated by the SEC would be submitting their financial statements directly into the SEC system.

Chesson predicted that Congress will become more involved in the accounting industry's role in MIS and systems integration and said it is likely that some sort of regulation or law will result.

"The issue is not going to go away. It is going forward, and we have the attention of the accounting industry," Chesson said.

Meanwhile, several of the Big Eight accounting firms have made overtures to ADAPSO about joining the association. At the ADAPSO management conference, the prevailing sentiment of the members was to admit accounting firms.

Microvax users get direct link to IBM SNA environments

DEC unwraps bridge for Ethernet system

By John Dix

MERRIMACK, N.H. — Digital Equipment Corp. released software last week that enables three of its supermicro products to participate directly in IBM network environments.

The VMS/SNA product will provide Microvax products with a direct link into IBM's Systems Network Architecture (SNA) that does not go through Decnet, the traditional method that DEC has used for links to Big Blue. DEC envisions that the product will be used where only occasional SNA links are required.

The minicomputer manufacturer also unveiled LAN Bridge 100, a device that can be used to connect up to eight Ethernet segments to construct a logical net spanning 22,000 feet.

Layered MicroVMS software

VMS/SNA is a layered MicroVMS software product for DEC's Microvax I and II supermicrocomputers and for the engineering configuration of that product line, the Vaxstation II. It enables these DEC devices to emulate a multifunction version of IBM's 3274 cluster controller, a Type 2 physical unit within IBM's SNA.

DEC cautioned that because VMS/SNA requires the Microvax products to perform network processing — as opposed to dedicating a processor to these tasks as DEC does with its other gateway products — performance limitations will restrict VMS/SNA's use to low-volume, single-system SNA links.

Emulating a controller enables the DEC processors to support IBM SNA LU0, LU1, LU2 and LU6.2, according to Dave Korf, marketing manager of DEC's multivendor networking products. Logical unit designations, representing either devices or programs, determine possible networking functions within SNA.

IBM applications accessed

Running under Version 4.2 of MicroVMS, Microvax and Vaxstation II processors with VMS/SNA can, according to DEC, access IBM applications; act as 3270 display stations, RJE stations or 3287 remote printers; and implement distributed application programs running between MicroVMS and IBM systems.

Additionally, DEC processors with VMS/SNA can create and exchange final-form documents and electronic mail with IBM's Distributed Office Systems Support (DISOSS). Users can also search and retrieve documents that are classified as revisable within DISOSS but cannot yet modify these documents under VMS/SNA.

The software is said to use many of the same access routines and user interfaces as DEC's Decnet/SNA Gateway, facilitating migration to this full-function gate when and if needed. VMS/SNA will be available in December for $2,500.

DEC's LAN Bridge 100, also announced last week, will enable users to interconnect up to eight fully configured, 2,800-meter Ethernet segments by installing a bridge between each segment, Korf maintained. Throughput of an extended Ethernet matches that of a single-segment net, according to Korf.

Because the bridge is intelligent, it is capable of localizing traffic, stopping signals destined for a device on the same cable from spilling over into adjoining segments. Korf said the bridges constantly relearn where devices sit on the net, enabling equipment to be moved from one cable segment to another. Any Ethernet/IEEE 802.3 protocol is supported.

Two versions of bridge

There are two versions of the bridge. The first bridges baseband-to-baseband, broadband-to-broadband, or baseband-to-broadband cable segments and sells for $8,000; the other connects baseband or broadband coaxial nets to fiber-optic Ethernet implementations and costs $8,500. Both will be available in January.

Software to manage these bridges was also introduced. The Remote Network Management Bridge Software enables users to monitor the performance of remote bridges, modify bridge parameters and initiate bridge tests.

The management software — capable of supporting all bridges — costs $600 for Microvax I and II systems; $1,000 for VAX-11/730, 750, 780 and 785 systems; and $1,500 for VAX 8600 systems. All versions will be available in March. In other news, DEC announced a new version of WPS-Plus text processing software. Version 2 of WPS-Plus has been enhanced for use on DEC systems and extended for use with IBM's Personal Computer and Personal Computer XTs.

WPS-Plus enhancements include a spelling checker option, a usage alert (a linguistic feature said to help identify the misuse of such words as effect and affect) and an electronic thesaurus. The version ranges in price from $5,700 for the Microvax II to $14,200 for the VAX 8600. An optional American Legal Words Lexicon of 25,000 words, based on Houghton Mifflin Co.'s *The Legal Word Book*, ranges in price from $600 for the Microvax II to $1,500 for the VAX 8600. Both will be available in November.

DEC to announce four-pronged CD-ROM campaign

By Eric Bender

MAYNARD, Mass. — Digital Equipment Corp. will thrust further into the emerging compact disk read-only memory (CD-ROM) market this week with a four-pronged announcement that may represent a major boost for commercial applications of the optical storage technology.

Hoping to lead the way to commercial acceptance of CD-ROM technology that can store 600M bytes on read-only optical disks, DEC will announce the following:

- The first commercially available data bases on CD-ROM disks from leading data base publishers in chemistry and engineering.
- Endorsement of the DEC-developed Uni-File standard file format by Lotus Development Corp., 3M Corp. and Tecmar, Inc.
- Uni-File-compatible CD-ROM units for IBM and DEC micros.
- Expansion of application development services for information distributors.

DEC will offer five data base titles, covering publications from Engineering Information, Inc., the National Technical Information Service and Chemical Abstracts Service.

The titles will be sold as yearly subscriptions with quarterly updates and will be priced between $1,150 and $1,195. The disks include DEC's Microbasis search and retrieval software for either MicroVMS or MS-DOS operating systems.

The lack of standard file formats has been "one of the issues constraining a full-fledged leap into CD-ROM technology," said Ed Schmid, compact-disk market development manager. "But DEC is the only one delivering systems products in volume," which will help to solidify the Uni-File standard, he said. Documentation on the file format is available from DEC at cost and carries no licensing requirements, he said.

CD-ROM drives for the IBM Personal Computer and DEC Rainbow 100 lines will be available in December for less than $2,300, Schmid said. Jointly developed with Tecmar, the DEC model will be sold by the Solon, Ohio, firm, while the IBM version will be offered by DEC. Both offerings are complete subsystems configured to work with Uni-File disks so that no additional software or other equipment is needed for customers to install and use them, DEC said.

DEC also will broaden its application development services offerings for CD-ROM to handle a complete set of data base preparation tasks, Schmid said: "We will take magnetic tape from customers, and we will hand back CD-ROM disks with fully usable data bases for MS-DOS or MicroVMS, all done in the Uni-File format structure." Prices for the full service are expected to range from $15,000 to $75,000.

AT&T seeks rate increase

By Bryan Wilkins

WASHINGTON, D.C. — AT&T Communications recently filed for a rate increase in its Accunet family of packet-switching services for data communications to meet Federal Communications Commission concerns that existing tariffs were subsidized and that the service was tailored for AT&T Communications and not for other users.

AT&T said it would increase its charge for entering the Accunet data communications network by 5% for 4.8K- and 9.6K bit/sec. service and by 15% for its 56K bit/sec. service. The proposed tariff would also establish a flat business day usage rate of 75 cents per kilopacket transmitted instead of its current tariff, where kilopacket rates start at 82 cents and drop to 67 cents based on volume transmitted. Other charges associated with installation and maintenance would rise by 10%, AT&T said.

AT&T said that Accunet would be available in 100 U.S. cities by the end of 1985. The proposed tariff changes would go into effect if approved by the FCC on Nov. 18.

In another significant action, the FCC on Oct. 4 established new guidelines that will permit AT&T Communications to introduce "optional calling plans," such as bulk calling at discounted rates or distance-insensitive calling, under pricing mechanisms that do not require that the service pay for itself. Instead, the service must show a net contribution to the total revenues of all AT&T long-distance service categories. Specifically, the optional calling plan or package must show a three-year net contribution to the service revenues of the carrier offering the service.

AT&T Communications has asked the FCC for permission to introduce long-distance services to meet competitive pressures of other carriers. The FCC recently denied it permission to offer a service, Pro America, after determining that the costs of offering the service and the demand stimulated for it were not adequately forcast by AT&T. Presumably, AT&T will reintroduce its Pro America tariff, which would offer users a flat 15% discount on the purchase of a block of calling time.

VIEWPOINT

EDITORIAL

Everything's relational

In a perfect world, all computer sales would be conducted one on one between a sales representative with a keen sense of product accountability and a user with an inexhaustible knowledge of technology. Questions would be asked and answered, claims challenged and defended, tests run and simulations performed.

Ah, sweet utopia. Although such sales reps and users no doubt exist, all too often the welter of products and features induce even the most reputable of vendors to fall inevitably into the trap of resorting to buzzwords, catchphrases and other linguistic shortcuts to make their marketing pitches. Matchless technical constructs are thereby reduced to barker's patter.

Nowhere has this more been the case than with software features. Think of "integrated" software and "multitasking" software or the many ways that we have heard used such terms as on-line processing, artificial intelligence or relational data base management system. These are not marginal features as in the claims for paper towels that are 20% more absorbent. They bear upon functions critical to the operation of large organizations, affecting untold numbers of people and vital operations. Yet today there is often no effective way to ask questions or challenge claims.

In the matter of one of these software feature claims, *relational* data base management, author E. F. Codd — who, not coincidentally, developed the concept — uses the pages of this week's *Computerworld* to survey the terrain and report his disdain of what he sees.

"It is hard to find a vendor who does not claim his DBMS is relational," Codd assays. "Some vendors of nonrelational DMBS have quickly (and recently) added a few relational features — in some cases very few features — to be able to claim that their systems are relational, even though they may not meet the simple requirements for being rated minimally relational."

Although we urge every DBMS customer to read Codd's article (Part Two will run next week), the regrettable truth is that there cannot be an E. F. Codd hovering over every computer software sales transaction. Consultants can be of some use, but what consultant can examine every product's every claim?

Trade journals can be of some use, but — and we speak with some authority on the subject — what trade journal can thoroughly probe every product's every claim? The consequence is that users must too often take enormous risks in accepting vendor claims for product function and hope that the end results justify these discomforting means.

This situation is hardly tolerable. It may also be, momentarily at least, insoluble. The last thing the computer industry needs is some sort of truth-in-packaging legislation that sets up a phalanx of bureaucratic retainers to settle distinctions such as those between relational and hierarchical DBMS.

What will help is for individual users, large business organizations and elements of the industry itself to keep vendors honest by calling into question dubious feature claims and unacceptable resort to cant. We offer the pages of *Computerworld* to such worthy exercises and invite your contributions.

LETTERS TO THE EDITOR

Track record provides viable gauge of applicant's work performance

In the Reader's Platform "DP employers on the wrong track with job histories" [CW, July 22], the author claimed that applicants' job histories are inappropriate as a major tool in the selection of employees. I contend that for experienced candidates no voice speaks more clearly for their qualifications and abilities than job histories.

Although to some the expression "track record" connotes a race, to me it carries a somewhat less cynical meaning — performance. That people accomplished an assignment or demonstrated dedication to an employer or were recognized for contributions by promotions and raises leads me to expect that they might perform for me.

As to the achievement of job levels within prescribed time frames, there are many excellent technicians in the profession whose assignment as project leaders or managers would toll a death knell for their careers. Given the correct environment, these individuals can be real heroes. Spending 20 years, however, becoming the best table coder in the country does cast doubt on an individual's drive and creativity.

U.S. business is being run on an infrastructure of billions of lines of code, many of which were designed and written by people who lacked demonstrable qualifications. To whatever degree the DP profession is responsible for the problems of the economy, it is more because of the lack of track records than of dependence on them as tools for selecting employees.

In fact, I submit the following:

- Top performers are rarely unemployed for extended periods except in geographically isolated markets.
- Top performers are the last to go when economic conditions decline and are the first to find work or to be recalled.
- Most candidates for higher level DP jobs are recruited rather than search for jobs.
- The best performers will be strongly self-motivated, and a good manager will help them develop that trait.
- A well-written resume could convey to a prospective employers any pertinent information about a candidate's goals and preferences, as well as the dreaded "job history."

Robert A. Roy
Chatsworth, Calif

Too much emphasis placed on systems when considering programmers for jobs

In programmer "help wanted" advertisements, too much importance is usually placed on hardware and systems, and not enough emphasis is placed on people.

If the advertisement calls for someone who has programmed on such and such a computer in such and such a system, applicants must have programmed on that computer in that system; otherwise, no matter how talented they are, they won't be considered.

Such rigidity enables the company that ran the ad to single out eight applicants from 80. It enables the company that ran the ad to hire a programmer who will get up to speed in a matter of days, if not hours.

But such rigidity ignores the desirability of choosing the applicant whose aptitude best meshes with the long-range requirements of the job. Moreover, it ignores the desirability of picking the applicant who is the best fit in terms of personality, character and goals.

David Canfield
Los Gatos, Calif.

Foreign students with computer access pose danger to U.S. national security

I disagree strongly with Charles P. Lecht's column "On students, computers and the Soviets," which talks about possible dangers of giving foreigners access to very large computers in the U.S. [CW, Sept. 9].

Would Lecht advocate having a company teach sales representatives from competing companies how to be better sales representatives so that they could take away its customers? Would Lecht advocate having a company teach the engineers of its competitors to make products equal to or better than his own so his firm would lose business to its competitors? Of course not.

Then why does he advocate bringing students into the U.S. and giving them access to our best technology so that they can go home and use it against the U.S.? It does not make any sense to me at all.

Truman Hunter
Oxford, Ohio

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VIEWPOINT

The IBM-NTT connection

LECHT ON SCIENCE
Charles P. Lecht

On Sept. 25, the morning edition of the *Yomiuri Shimbun*, one of Japan's leading newspapers, carried a front-page story saying that it believed IBM and Nippon Telegraph and Telephone Public Corp. (NTT) would enter into a 50-50 joint venture to create and operate a gigantic international data processing and communications enterprise. On the same day, 4 p.m. Tokyo time, NTT and IBM Japan held a news conference to announce the venture.

On Sept. 26, *The Japan Times* carried the story under the headline, "NTT, IBM to establish joint communications company." No name has been assigned to the new joint venture, but let us call it INS using the first letters of IBM, NTT and the word "system."

The announcement said that NTT's president, Hisashi Shinto, and IBM Japan Ltd.'s president, Takeo Shiina, had reached an agreement to establish INS. Spokesmen for both companies said that the INS joint venture was capitalized at 600 million yen and that it was slated to begin operations by the end of this year. Shiro Matsuo, an NTT executive, said that INS would use IBM products, hardware and software.

Although the announcement was made in Japan, it did not specify that INS services would be limited to the Japanese marketplace — in fact, there was no reference made to marketplace locale. This, of course, suggests that the companies intend that it will ultimately become global. However, at the onset, it is hard to envision INS extending much beyond the geographical territories where the U.S. and Japan control the computer and communications markets.

That the two companies intend that their INS venture extend outside of Japan is clear, since IBM has already established a joint venture with the Mitsubishi Corp. to provide value-added network services within Japan. That joint venture company operates under the name of Advanced Systems Technology, Inc.

At the onset of its operations, INS will offer somewhat classic communications services, including those needed to interconnect value-added networks. It will ultimately evolve to be a mammoth international value-added network. Thus all we may want to do in information processing will be available within it. Businesses will become free from the tyrannical and costly national boundary problems that impede the flow of data and information. Educational institutions will be able to access each other's libraries. Other barriers that once served to limit the news services between countries will eventually crumble.

> ”
>
> ***The venture will ultimately evolve to be a mammoth international value-added network. Businesses will become free from the tyrannical and costly national boundary problems that impede the flow of data and information.***

No doubt IBM and NTT executives will have to overcome many problems to make INS a truly international and workable system. For example, IBM and NTT communications protocols are different. Apparently anticipating their eventual plan, the two companies launched a joint research project two years ago to overcome this incompatibility.

The project was successful; in December, INS will announce a software product that allows IBM customers whose systems support Systems Network Architecture protocols to communicate with systems supporting NTT's Data Communications Network Architecture protocols and vice versa. Then there are both human and machine language difficulties, cost and competition problems and so on to overcome.

Those problems that originate solely by virtue of the size of the parties involved will offer IBM and NTT a great challenge. The joint venture is, after all, between the largest company in Japan and one of the largest in the U.S., an organization that is approximately $20 billion per year larger than NTT.

The headquarters of INS will be in Tokyo, but it is hard to imagine that IBM will leave it up to its Japanese subsidiary to control fully its NTT relationship. Armonk, N.Y., will have a lot to say about the future of INS. Why else was Shinto traveling to Armonk on Sept. 27 to confer with IBM's John Opel and John Akers when Shinto was stopped by a hurricane?

As Opel wasn't in need of a speaking engagement when he attended NTT's International Symposium '85 in May — he went there to speak anyway — Shinto isn't in need of a trip to Armonk. Whatever decisions may come out of Shinto's visit to Armonk, we can and must admire the IBM and NTT management for their daring and imagination in making the INS joint venture possible.

The joining of significant parts of the communications and computer systems of the U.S. and Japan must be viewed as an event of great significance in creating greater international cooperation and as an important step toward world peace.

Lecht is chairman of Lecht Sciences, Inc., a New York-based think tank specializing in computer and communications technologies.

What's right about Unix

READER'S PLATFORM
Ernest Wyle Harkins

Although Unix seems to have become the latest buzzword in computer circles, many opinions about it voiced in the press seem ill founded at best and downright wrong at worst. Not surprisingly, some of the harshest criticism comes from "experts" who have a vested interest in competing solutions.

Some negative points that are repeated often date back to vintage 1979 versions; most if not all of those old chestnuts have been dealt with in the modern AT&T Unix System V incarnations.

Industry pundits cite a lack of applications software, but that seems more an indication that they are not looking than a real reflection of 1985's Unix marketplace. Hundreds, if not thousands, of applications exist in diverse areas, from finance to geophysics. How many general ledger packages do you need anyway?

The alleged unfriendliness of Unix, which true believers would claim is mere unfamiliarity bordering on unreasoning hostility, has been successfully hidden by the now traditional menu systems that look much like those of other approaches. Unix has become such a ubiquitous development environment that it is buried in all sorts of products and virtually all computer-aided design and manufacturing systems.

Rather than laboring through a point-by-point refutation of negative comments, it seems more pertinent to focus on what's right about Unix.

Why does Unix make more sense than one or more personal computers? The primary dividing line is one of multiuser vs. single-user organization. Because a Unix system is built around a relatively large hard disk, all programs are simultaneously available to all users. Likewise, all users can copy data easily to or from each other and can share easily the keywork on a large document. Because there is only one copy of each utility program, updates are simple and global.

A Unix system imposes a simple, predictable hierarchy on the physical resources — for example, disks,

Continued on page 22

Harkins is senior consultant and data center manager for DHR, Inc. in Boulder, Colo.

Using plans as yardsticks

READER'S PLATFORM
David A. Binius

Information systems department projects are typically late and overbudget.

This has, unfortunately, come to be an accepted fact — a self-fulfilling prophecy — and will remain so unless professionals act to change this totally unnecessary belief.

There are two quotes that I would like to see hanging in the office of every data processing professional who has responsibility for project development and management.

"If you can't plan it, you can't do it."

"If you can't measure it, you can't manage it."

If we live by these two simple ideas, our task becomes simpler and ultimately more professional. When we properly formulate a plan for a project or a task, we have the capability of measuring it; therefore, we can effectively manage it.

Management success often is determined on the basis of whether or not projects are completed within the agreed-upon schedule and budget. The trap that we fall into is allowing ourselves to be forced into giving estimated completion dates before we have a good project plan.

Off-the-cuff completion dates

As data processing professionals, we cannot give off-the-cuff completion dates because we believe we know what the user wants, and we know how long it will take to accomplish it.

Data processing professionals should at the very least have a solid system definition with a statement of achievable objectives, agreed-upon input and output, data base requirements and system processing schedules prior to setting project completion dates.

Like an architect's blueprints, the system definition will be the basis for the detailed plan from which manageable milestones, and finally, completion dates are set.

The project plan is a ruler to measure and manage the project. Of course, regardless of how comprehensive the original system defini-

Continued on page 22

Binius is director of data processing for Wick Building Systems, a Madison, Wis. manufacturing company.

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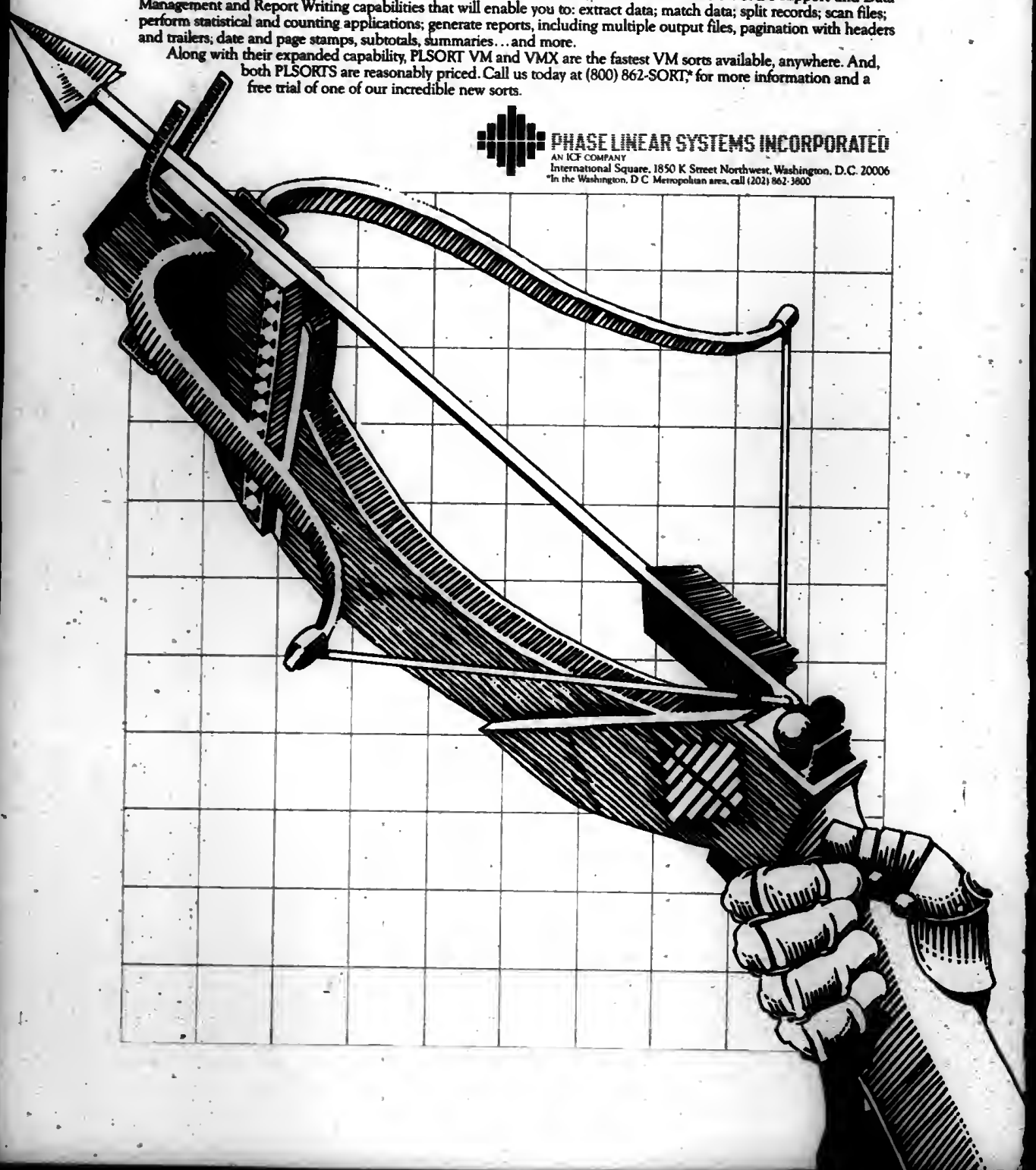

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Cobol tug-of-war leading to language's evolution

READER'S PLATFORM
Jerome Garfunkel

The public has for some time heard many claims from the critics of Cobol 85. Two completely opposing points of view have emerged. Some say the language is obsolete and no revision, however significant, could make it relevant to today's application development needs. For them, it's like dressing a dinosaur in Calvin Klein jeans hoping to make it attractive.

At the other end of the spectrum, others argue that Cobol needs to be absolutely stable. Just keep it as it is, or as it was in 1968, in spite of its flaws and its ambiguities. So what if it is not as common as the drafters of this "Common Business-Oriented Language" would like.

For these critics, the cost to change to modern-day application development tools is not justified. Perhaps they believe that fourth-generation application development tools and debugging/testing aids are just passing fads. To this group I offer some recent words from Grace Hopper: "Continually look ahead to absorb the new concepts and implement the new things. Don't ever say, 'Well, we have always done it that way.' That is the deadly thing that kills systems and managers."

Two extreme viewpoints

When one steps back for a moment, one sees clearly that these two extreme viewpoints need to be rejected by practical people. However, the tug-of-war that has resulted from this ongoing data processing debate has benefited the Cobol language. Immensely.

Those who claim that no revision of Cobol, however radical, could be significant, have caused the Cobol 85 language to be much more than just a cosmetic overhaul of the old Cobol.

The substantial additions and improvements in Cobol 85 will make it easier to use with current software development methodologies and will ultimately ease the growing problem of systems maintenance. Nothing short of that would have been acceptable.

Those critics of Cobol 85 who demanded absolute compatibility with older versions of Cobol have caused the computing public and, perhaps more important, the Cobol language developers to be very sensitive to the impact of an evolving Cobol language on the data processing community.

We learned this lesson the hard way and caused a four-year delay in the new Cobol 85, but we did take heed. As a result, procedures now exist to assess the impact of future Cobol revisions before they are made.

Updating Cobol

The continuing task of updating the Cobol language must not slow down now, any more than that of other application development tools. If we learned one thing about software systems during the last two decades, it was that change is a natural process affecting every system, and we must design these systems with anticipated changes in mind.

The same must be said about software tools like Cobol. Cobol must be responsive to new techniques and methodologies that evolve, and it must do so in a careful, minimally disruptive fashion.

Experimenting with new approaches to old problems — productivity aids, systems debuggers, program testers, automatic documentors and code generators — many data processing managers forget that perhaps the one application development tool that is most important in the life of a system is the programming language itself.

Garfunkel is a Cobol 85 consultant based in Litchfield, Conn., who was a member of the American National Standards Institute X3J4 Cobol Committee.

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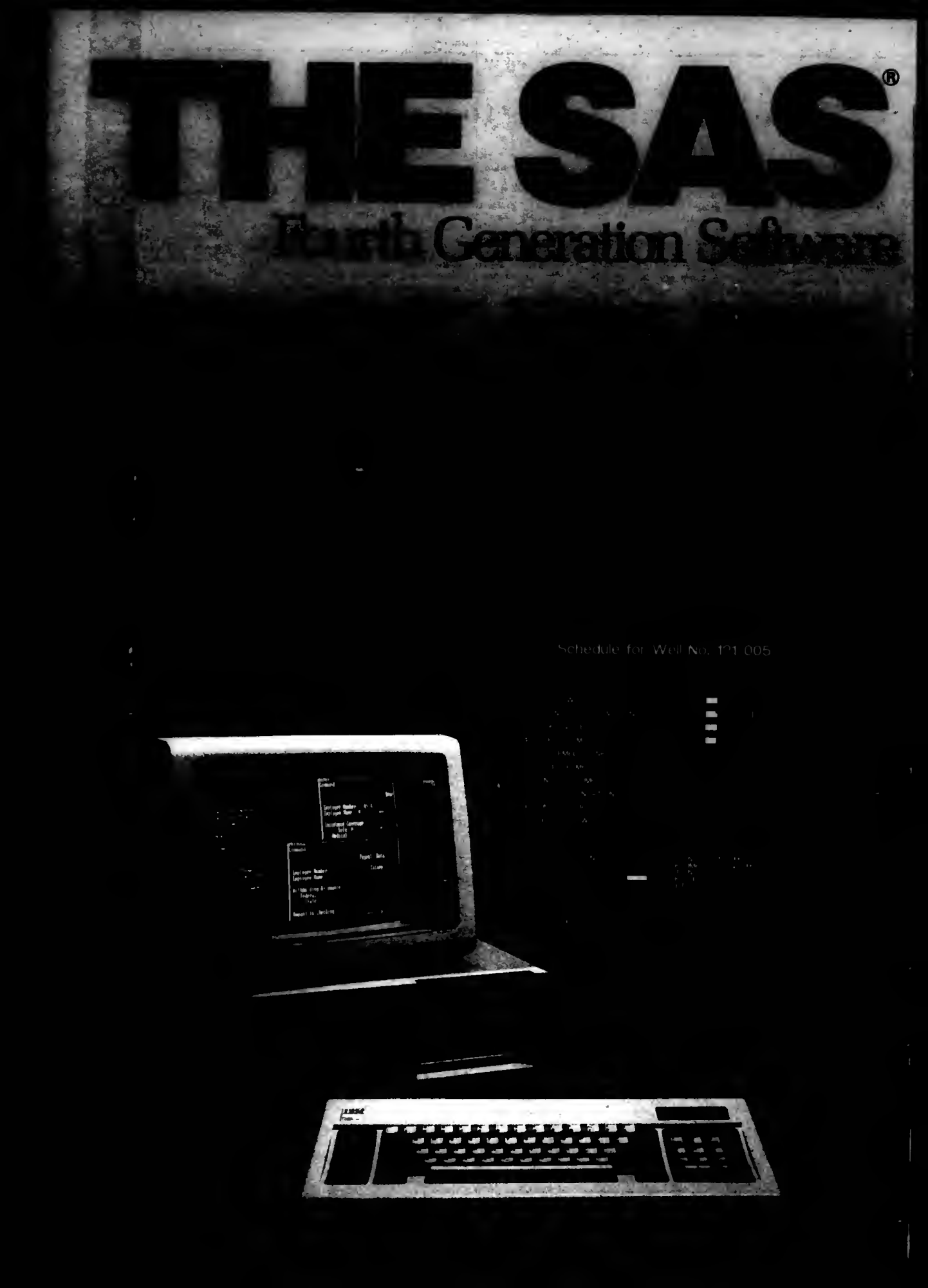

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VIEWPOINT

From page 17

What's right about Unix

terminals and users — from the outset. A network of linked personal computers must impose these relationships from the network point of view after the fact [*Computerworld Extra*, Sept. 25].

Communications between one Unix system and another are accomplished easily using standard utilities, allowing remote execution, file transfers and electronic mail.

Personal computers can be used as smart terminals with a Unix host, and with some vendor's software, notably AT&T's, the Unix system can serve as a logical hard disk for the personal computer.

Because Unix is multiuser, the incremental cost — assuming there are available ports on the host machine — of adding new terminals is low, on the order of $500.

Varying user space requirements are more easily accommodated since there are no hard boundaries imposed by individually managed floppies or hard disks; if one user needs lots of space, it is taken away effectively from the pool available to all users, but nothing special needs to be done.

From a computing strategy viewpoint, Unix makes sense in several ways: As users' needs grow, more memory, disks or other peripherals can be added, or the entire Unix environment can be carried over to a larger Unix machine, perhaps one of a different manufacturer. Unix boxes now range from the one- to four-user IBM Personal Computer AT or AT&T Unix PC all the way up to the 200- to 300-user Amdahl Corp. or Sperry Corp. machines.

For the hard-core number cruncher there is the new Cray Research, Inc. Cray-2 at $17.6 million also running System V. Virtually all significant manufacturers have joined the Unix parade.

Never before have DP managers been able to contemplate a major conversion to a new machine with such equanimity. Local applications software can simply be carried over to the new machine and recompiled; the advent of System V as a de facto standard has mooted the minimal difficulty of making code developed under one version of Unix run correctly under a different version.

For the user, an upgrade to a new Unix system would mean minimal downtime and nothing new to learn. The major difference would probably be that "it seems faster now."

From page 17

Using plans as yardsticks

tion and plan are, there will often be some necessity for revision.

Projects will have changes and modifications as more information is received and as work progresses. Once again, though, if the plan is good, we can readily identify and incorporate the changes into it and reissue completion dates.

We aren't likely to be criticized for revising completion dates if there are good documented reasons such as expanded system requirements or the loss of key individuals on the project. What we should be criticized for is missed completion dates because we didn't plan the project well enough to arrive at accurate timetables for project tasks.

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CW1014

The Japanese connection: National Semi's bifocal view

By Jeffry Beeler

National Advanced Systems Corp. (NAS) of Mountain View, Calif., recently found itself in the unusual position of seeing its Japanese business partner accused of violating American trade law by NAS' own U.S.-based parent company.

NAS is wholly owned by National Semiconductor Corp., one of three U.S. chip manufacturers that on Sept. 30 accused Japan of dumping erasable programmable read-only memory (EPROM) chips into the American market.

But in a strange twist of fate, the National Semiconductor subsidiary also happens to be the exclusive U.S. outlet for Hitachi Ltd.'s medium- and large-scale line of IBM-compatible mainframes.

Hitachi figures prominently in a Sept. 30 petition that NAS' parent company and two other U.S. semiconductor firms — Advanced Micro Devices, Inc. and Intel Corp. — filed with the U.S. Department of Commerce and the International Trade Commission. The joint petition accuses Hitachi and seven other Japanese chip makers of selling EPROMs to American buyers below cost.

But despite the legal dispute between National Semiconductor and Hitachi, NAS expects its business relationship with the Japanese company to remain fundamentally unchanged, according to a spokesman for the mainframe vendor.

A source with NAS' parent firm agreed. "Mainframes and semiconductors are two entirely separate lines of business," he said. "We have to pursue the EPROM issue because of its extreme importance to the semiconductor industry. But at the same time, we feel we can keep the matter totally apart from our NAS-Hitachi relationship, which we still value highly."

■

WEST COAST UPDATE

California state legislators have deferred action on a proposed constitutional amendment that would strengthen the legal safeguards governing the privacy of personal computer-stored information.

Earlier in the year, the amendment breezed through two committees of the California Assembly but then recently hit at least a temporary legislative snag on the full assembly floor.

Thurman White, consultant to Assemblywoman Gwen Moore (D-Los Angeles), partly attributed the delay to the proposed amendment's legislative novelty. "It's new in the sense that we're trying to make some explicit constitutional provisions apply to electronic information," White said. "But our efforts have inevitably resulted in some confusion over what we're trying to accomplish and what the long-term constitutional implications would be."

White also blamed the delay on the assembly's natural reluctance to act on a proposal to change the state's constitution.

The amendment's supporters had originally expected their recommendation to complete its journey through the legislative mill by the end of the summer. But before the assembly could finish debating the amendment's legal ramifications, the latest session of the California legislature adjourned.

The assembly is expected to resume consideration of the amendment when the legislature reconvenes after the first of the year, White said.

Introduced by Moore last January, the proposed amendment would extend to personal computer-stored information the same constitutional protections that traditionally have applied to tangible property.

Existing California law explicitly protects items like personal computer hardware against unwarranted search and seizure. But whether the same safeguards also cover a microcomputer's information

Continued on page 28

Fire fuels bank's drive to revamp word processing unit

By Donna Raimondi

MINNEAPOLIS — A disastrous fire in Norwest Bank Minneapolis NA's corporate headquarters three years ago led the way to a more efficient word processing system for the company.

In 1982, the word processing functions at Norwest were as much a disaster as the company's gutted corporate headquarters building. The expenses and the need to relocate after the Thanksgiving 1982 fire caused the company to cut back on supervisory staff and increase the number of remote word processing service centers as part of the reorganization efforts.

There is now a main word processing center with 19 operators and four small satellite centers that share the services of two full-time clerks and a part-time employee. The bank will continue to occupy offices in 23 buildings in downtown Minneapolis until its new corporate headquarters building is ready in 1987, said Karen R. Miller, assistant vice-president of the operations group and manager of the word processing division.

Four different vendors' systems and a lack of operating standards gave the more than 900 internal clients of the word processing division mixed signals about policies and about the costs that were charged back to their departments for word processing services. By the end of 1982, the word processing division was in the red, and clients of the service were starting to look at buying their own departmental systems, Miller said.

But by the end of 1984, two years after installing Wang Laboratories, Inc. VS 100 equipment and an in-house-developed Cobol word processing management system, the division had reduced its staff from 39 to 24 people, increased productivity by 6% and increased its hourly average output by 106%, Miller said. Previously, the center was uncertain about costs related to individual documents, but now it has a system of eight weighted charge types based on job difficulty and the time required to perform the job, she said.

The VS 100 has 109 devices attached to it. The 68 terminals, five disk drives, a backup tape drive, four telecommunications devices and 31 printers are spread out over several buildings because of the fire, but they are all cabled directly to the host. The devices can be a maximum of 2,000 feet from the computer, but the bank was able to hook up the devices by laying cable through the city's extensive skyway system, Miller said.

Manual form next target

A manual input document form is used to track each piece of work from start to finish and to compile pertinent information on a particular job. The form is filled out partly by the client and partly by the operator. Miller hopes to put that form — which takes one person nine to 12 hours a week to enter into the system — on-line when her "far-flung" empire consolidates in one building in 1987.

From the information entered from the form and from a data base of pricing information, managers can access data on cost control, operator productivity and profit and loss figures for the word processing division, Miller said. They can sort data by source, document type and site to glean information about how documents were created.

One report generated by the system contains information on operator productivity. Supervisors now sit with each operator once a month to discuss whatever issues the report has raised. "It took two years to overcome operator resistance to this report," Miller said. Each operator is now compared with his own past progress and not to other operators.

To establish guidelines for the operators, Miller and her staff reviewed industry standards and an in-house study.

Continued on page 28

GAO report faults SSA system upgrade

By Mitch Betts

WASHINGTON, D.C. — The $500 million computer modernization program at the Social Security Administration (SSA) so far has not improved the agency's ability to accommodate legislative changes in the Social Security program, according to a new congressional audit.

"Although [the] SSA has succeeded in upgrading its hardware under the capacity upgrade program, it has made little progress in improving its ability to respond to legislative changes that require software modification to existing systems," the General Accounting Office (GAO) report said.

The reason, according to the GAO, is that the SSA has not met the software improvement goals spelled out in its 1982 Software Modernization Plan that include a complete redesign of the software, better software maintenance and proper documentation.

The agency must frequently change its software when the U.S. Congress passes a law changing the regulations of the Social Security program.

For example, 1983 legislation provided for the taxation of Social Security payments to upper income retirees, which required the SSA to create a new data base and write new software.

The GAO noted that the SSA met the deadlines for these changes. But the audit said this was because the agency diverted 40 top programmers to building the programs, taking them away from the software improvement and redesign projects.

The GAO asserted that the agency would still have trouble responding quickly to new legislation in cases where it has to modify older software, much of which is still poorly documented and maintained.

Furthermore, the GAO audit said the agency needs to implement additional security measures to protect its system from fraud. The GAO praised the SSA for implementing a logon/logoff procedure that identifies users who make data entries.

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West Coast Update

depends on "the vagaries of court interpretation," White said.

■

In a related development, the California legislature also has decided to hold in abeyance a proposed law that seeks to merge the state's information systems and telecommunications activities under a single unified organization.

If Assembly Bill 808 is enacted into law, it would reportedly create the first integrated information systems and telecommunications effort in state or federal government history.

The bill has already passed both houses of the state legislature and recently went to a legislative conference committee consisting of three state senators and three assemblymen.

From page 27

Fire fuels bank's drive to revamp WP unit

The findings showed that 20% of an operator's time is spent on things other than word processing activities. Each operator produces an average of seven to 11 pages per hour, and operator standards are strictly enforced by the two supervisors.

The word processing division is now able to enter into formal billing agreements with its clients, in which it promises low-cost services at a fast turnaround time (four hours for a dictation job). Rush jobs are automatically charged an extra 25% to cover the additional costs incurred and to discourage unnecessary priorities. Each quarter, reports show whether or not the division is operating within its guidelines. The automatic billing feature frees up almost half of one supervisor's time each month.

The system flags problems with operators, such as if the operator is doing too little work in a certain time period, or if certain jobs take too long to do because they come in illegible, Miller said.

Not all of the benefits of the system derive directly from the equipment and software. For example, a divisional emphasis on quality at Norwest has cut down on errors. If operators have specific problems, the operators can be trained to eliminate them.

Miller said she has worked to eliminate specialists. All operators receive training in all areas, eliminating the queues that formed because a number of clients in the trust department, for instance, might want the services of an operator who was particularly adept at handling trust documents.

The reporting system's profit and loss analysis helps zero in on costs for each category of work that the division does, Miller said. "We discovered that we were doing a lot of non-word-processing jobs like check printing, so we eliminated lots of extraneous jobs," she added.

After three years of using the word processing information system and without increasing pricing, the company will break even on word processing operations this year. The average turnaround time of a job has improved by 70%, error rates have dropped by 43%, and average unit pricing of a document has decreased by 6%, she said.

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ICL banks on open systems strategy

Exec claims firm has put hard times behind

Bonfield is managing director of Britain's sole mainframe manufacturer.

After weathering hard times in the 1981 recession, International Computers Ltd. (ICL), Britain's sole mainframe computer manufacturer, has seen its revenue stream move steadily back into the black. The renewed profitability — after a 1981 loss of $64 million — was aided by a 33% reduction in the company's work force and infusions of cash from the British government and ICL's new owner, Standard Telephones & Cables, Plc., which purchased ICL last year.

The rejuvenation is also due to the firm's new emphasis on technological partnerships, with firms such as AT&T and Fujitsu Ltd., and the products that are coming out of those joint ventures. Two new ICL mainframes are being made in Britain, using Fujitsu large-scale integration chips, and last month, the British government signed a $100 million contract for 18 of those machines for use in a nationwide data processing and communications network.

New products and a change in corporate culture have rekindled ICL's competitiveness. In a recent exclusive interview with *Computerworld* International Editor Edward Warner, ICL's managing director Peter Bonfield discussed where ICL is going and how it will get there.

In 1981, ICL was $64 million in the red. Are the hard times over for the company?

I think the dramatic changes are over. I don't think that we are now in a situation where we will have to lay off a third of our people. I think from that point of view, they're over. I think the dramatic changes are still going on in the marketplace, and we're still faced with dramatic changes. Considering [that] the industry this year has gone through turmoil, I think that we are [doing] credibly well.

I've heard it said by some people that your company is becoming Americanized, that your people are working longer hours, that ICL has reorganized into strategic business units. Is your corporate culture changing remarkably?

We have absolutely gone out to change the corporate culture, and we have done it several ways, actually. Part of it is bringing in management that is of a different culture. We have tried to get all of the managers that we have brought in [from] similar backgrounds. They have all worked in international companies. They have mostly worked internationally. Most of them are relatively young [and] aggressive, and we have also put in a major program to change the culture of our management team. I don't think that we would say that it has changed to American methods. What we have actually tried to do is tailor American methods, Japanese methods and European methods and try to generate our own culture, [one of] moving fast and working long hours.

Isn't the fact that your mainframe operating system, VME, is non-IBM compatible a problem both in the British market and in your attempts to make an inroad in the U.S. market?

No, we believe that [being incompatible] is actually less of a problem than being IBM compatible. Because IBM owns the operating system, they are obviously [going to] do what they like with it. We own the VME operating system and, therefore, can do what we want to do with it. We know where it is going. It's significantly more advanced than [IBM's] MVS in terms of its ability [regarding] security and data handling because it is basically newer.

The other thing is that [ICL machines] actually coexist in an IBM environment so we can actually put the machines in the network, and the network can coexist with an SNA [Systems Network Architecture] network.

According to your 1983 annual report, all of North and South America generated only 2% of ICL's revenue even though your operating unit in the U.S., ICL, Inc., is 10 years old. Does this mean that your efforts in the U.S. so far have failed?

I would say that we were relatively unsuccessful [in the U.S.] until about [1981] or [1982]. I joined ICL in [1981]. At that stage, I suppose the primary thrust in the U.S. had been a mirror image of the thrust in Europe, which was [to sell] across the range.

We have [now] concentrated purely in vertical markets. The primary [vertical market] that we chose was state governments, [such as] New York state [to which we sold] a Social Security system that is similar to some of the systems [in which] we have specialized in Europe.

If one of your larger markets is South Africa, what is ICL's position regarding sales to that nation? Are you considering a ban on sales?

No. I am a businessman, not a politician. I try to remove my personal thoughts on the political situation, and we will just comply with British law. We have been in South Africa a long time. We employ a lot of people there, and we have a lot of customers there. So, at the moment, we are not thinking about it at all. It doesn't mean that we condone apartheid or anything else.

Regarding the Japanese manufacturing of semiconductors for your mainframes, is it possible that further down the road ICL could become like National Advanced Systems, Corp. is the U.S., an OEM for Japanese mainframes?

Well, we are now [an OEM] in printers. We don't design or make our own printers. We source our printers from [Japan] and the U.S. I think that, [becoming a mainframe reseller] is a possibility. We will bring in pieces of hardware if they support open systems connectivity to integrate into our solutions. On the mainframe side, another interesting thing has happened over the last four years. In 1981, 76% of our business [in] hardware sales was on mainframes, and the [revenue] was about 700 million pounds. Now the [revenue] is [split] about 50-50 between hardware and smaller systems.

Does ICL's greater emphasis on communications products come from ICL's having been bought by Storage Technology Corp. (STC)?

About half of the 1,000 people or so that we have put into this network systems [development] came from STC companies. They have been moved into this new division ... called STC Network Systems, a management company of ICL. We have brought them in purely as a result of the merger. We definitely got more expertise in communications than we had as a computer company.

How else has the acquisition affected ICL?

To be quite honest, I think that [communications expertise] is the major area [in which] it has affected ICL. ICL is still run as a separate management company. We have our own board of directors [and so forth]. It is run at arm's length from the group, and we have picked up these skills that we needed for network and communications and added them to ICL. Apart from that, which I think is a pretty significant move, actually, there are no other major changes.

ICL is an AT&T Unix booster. Does your support for that operating system mean that we might see Unix-based applications on ICL machines soon?

Yes. We've got some ... Unix machines [now]. We signed two deals recently, one with a company called Data Media, [which] we have a partial stake in, and we have one of their Unix machines. We also did a deal with Computer Consoles, Inc. for [its] Office Power, which is [a] software system for office systems. Again, this runs on a Unix box.

So, you've put Office Power on an ICL machine?

Yes. The other thing that we are going to do is embed Unix in our mainframe operating system so that you will be able to run Office Power in the next year, or 18 months maybe, across the total ICL line.

VME can already host Unix?

Well, it can. We haven't actually released that into the market yet. We won't release that until the middle of next year. But we have told our customers that is the direction in which we are going.

What other new product directions, in the short run, might we see from ICL?

You will see enhancements to our mainframes. You will see larger machines coming out in the range. There has already been announced a Series 39, so there have already been extensions of that. You will see more networking capability on our products. You will see smaller machines that can fit into open systems networks. You will see more Unix boxes and extensions of our voice/data line, and [you] will see more applications in vertical markets.

If the reason for the erosion of your market is Europe is IBM, what steps are you taking to counter that erosion?

I think that to have a company the size of IBM, $50 billion dollars compared with our $1.5 billion, is a serious competitive threat. Our approach is twofold: not to compete head-on with IBM and to try and generate a market which is not capable of being dominated by IBM. This, we believe, [is] the open [systems] market. Now, I am sure that IBM will get into supporting open systems in the open market, but once they do that they won't be able to dominate it as they [do] MVS or SNA.

Doesn't this place a lot of emphasis on the success of open systems, which is still something of a new trend?

Yes it does. [Open systems] is an increasing trend and certainly an increasing trend in Europe. No UK government order can be placed without complying with open systems. I think that you are starting to see this in the U.S., too.

NEWS

WORLD DIGEST
CW International News Network

LONDON — Micropro International Corp. of San Rafael, Calif., this year will introduce an AT&T Unix version of its Wordstar 2000 word processing program.

"It's not announced, but we have been doing a Unix version of 2000," Chairman Seymour Rubinstein said. Rubinstein added that, despite the much-vaunted portability of Unix software, his company has spent most of its development time tailoring the new program for different terminal types. Unix micros are not standardized in screen handling, a problem for programs like Wordstar 2000 that use memory-mapped video.

MEXICO CITY — A week after the largest earthquake in Mexico's history rocked this city, damage to computer and communications equipment alone was estimated at more than $25 million. Many buildings crumbled, including the Telefonos de Mexico S.A. and the Ministry of Communications — which together control all Mexican communications operations. Large telecommunications companies are helping the government to reestablish communications because almost all the equipment was destroyed.

TOKYO — Nippon Telegraph and Telephone Corp. has decided to buy a Cray Research, Inc. supercomputer, the Cray.XMP1, sometime in mid-1986. Details of the purchase, including cost, were not specified.

Nippon already owns one supercomputer, a Cray.XMP22, which it purchased in August 1984 for use at its basic technology lab.

PARIS — Seymour Cray, founder and president of supercomputer manufacturer Cray Research, Inc., said that his company will respond to IBM's announcement of a vector processor with a continuation of its effort to sell to the high end of the scientific market.

Cray Research, a major player in the $1 billion supercomputer market, has several cross-development agreements with IBM but was not involved in development of the new IBM product, Cray said. In all, Cray seemed unperturbed by the IBM announcement.

LONDON — Richard Perle, U.S. undersecretary for defense, acknowledged last week that computer exports from Western nations to China were being delayed by Cocom, an agency that regulates the export of strategic high-technology goods from Western countries. Cocom is made up of representatives of the North Atlantic Treaty Organization countries and Japan.

Computer exports to China could speed up, however, if a U.S. Department of Defense proposal to expand the Cocom staff is approved. "It costs under $1 million a year. We could do that and still not create a significant bureaucracy," said Perle, adding that the large volume of international trade agreements with China hinder European computer companies when they seek export licenses.

LONDON — Integrated Business Communications, a UK-based communications company, said it is holding discussions with the British Defense Ministry regarding Integrated Business' new encryption scheme, which has reportedly been certified by the government's communications headquarters as unbreakable.

The firm is selling the product as an enhancement to its range of plug-in communications boards for the IBM Personal Computer and compatibles. The boards reportedly permit the machines to communicate using a mix of X.25, telex and asynchronous communications interfaces.

PARIS — The French Telecommunications Association has helped support a new law — and a new sales method — through its Minitel Videotex System. In August, an interactive data base on used cars was added to the nation's government-supported electronic information service.

The round-the-clock listing allows potential car buyers to shop at their convenience and save time. By entering any of six criteria — make, model, year, mileage, region where available and price range — shoppers can find the car they want. The seller's name and address appears automatically with the listing.

There is no fee for accessing the data base, though sellers pay between $7 and $12 to list a car for three weeks. To complement this listing, the addition of credit terms and an auto insurance service is currently being considered. The used car listing was made possible by a new law that requires used cars to pass a government inspection before being sold.

CROWS NEST, Australia — Parts of *Australian Macworld*, a computer magazine, have been made available on a public information network system called Teledata. Included in the information network are complete listings of Apple Computer, Inc. Macintosh hardware and software available in Australia, selected stories and a full listing of the contents from the current issue of *Australian Macworld*, a news summary and previews of forthcoming issues of the magazine.

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NEWS

CALL FOR PAPERS

ANNUAL SMALL COLLEGE COMPUTING SYMPOSIUM
Rapid City, S.D., April 11-12

Authors are invited to submit papers in the following areas: using computers as a teaching aid, the microcomputer, graphics, trends for the future, curriculum and computer applications in all academic areas.

Papers should be submitted by Dec. 2, 1985, and sent to Dale Rogrille, Mathematics and Computer Science Department, South Dakota School of Mines and Technology, Rapid City, S.D. 57701.

THE 1986 INTERNATIONAL ASSOCIATION FOR SOCIAL SCIENCE INFORMATION SERVICE AND TECHNOLOGY CONFERENCE (IASSIST)
Marina Del Rey, Calif., May 22-25

Authors are invited to submit papers on the following topics: data interchange; computer mapping; graphics; machine compatibility, micro/mainframe; mainframe software; comparability of election studies; relations and rectangular data bases; archive responsibility for public access; standards for thesauri to describe, classify, catalog data files; file transfer, downloading, uploading; funding for data collections and services; and the role of national governments in data collection.

Papers are to be submitted no later than Nov. 15, 1985, and addressed to IASSIST 1986 Program Committee, c/o Jackie McGee, Rand Corp., 1700 Main St., Santa Monica, Calif. 90406.

SEVENTEENTH ANNUAL PITTSBURGH CONFERENCE ON MODELING AND SIMULATION
April 24-25

Authors are now invited to submit papers that have not been previously published. Papers are requested on the following topics: microprocessors; personal computer applications and software; artificial intelligence; expert systems; robotics; social, economic and regional science; global modeling and simulation; and traditional areas of modeling and simulation.

Papers are due by Jan. 31 and should be sent to William G. Vogt or Marlin H. Miele, Modeling and Simulation Conference, 348 Benedum Engineering Hall, University of Pittsburgh, Pittsburgh, Pa. 15261.

THE VM SOFTWARE ANNUAL USER CONFERENCE
Washington, D.C., April 13-16

Papers for presentation at this first annual users conference are now being sought. Topics include VM Software, Inc.'s products and components, in particular VMcenter.

Abstracts of presentations should be limited to one page and sent to Andrea Merritt, VM Software, Suite 355, 2070 Chain Bridge Road, Vienna, Va. 22180. Abstracts are due no later than Nov. 30, 1985.

TWELFTH INTERNATIONAL CONFERENCE ON VERY LARGE DATA BASES
Kyoto, Japan, Aug. 25-28

Major topics of interest include but are not limited to the following: data models, data base theory, data base design methodology and tools and distributed data bases.

Papers should be submitted no later than Feb. 15 to one of the following program committee chairmen: Setsuo Ohsuga, University of Tokyo, 4-6-1, Komaba, Meguro-ku, Tokyo 153, Japan; Wesley Chu, Computer Sciences Department, University of California at Los Angeles, Los Angeles, Calif. 90024; or Georges Gardarin, Domaine de Voluceau Rocquencourt, B.P. 105-78153 Le Chesnay Cedex, France.

SYNERGY '86
Universal City, Calif., June 16-18

Synergy '86 is sponsored by the Society of Manufacturing Engineers, its Computer and Automated Systems Association and the American Production and Inventory Control Society. The sponsors are inviting submissions of abstracts of papers that present examples of synergy — the convergence of the planning, processes, controls and tools of manufacturing to attain quality results on the shop floor.

All papers are due no later than Oct. 21, 1985. Further information is available from Cheri Willetts, Technical Activities Department, Society of Manufacturing Engineers, P.O. Box 930, One SME Drive, Dearborn, Mich. 48121.

Computer security issues garner industry limelight

By Bryan Wilkins

GAITHERSBURG, Md. — The National Bureau of Standards (NBS), located on a sprawling complex, was host early this month to a huge new growth industry — computer security.

More than 1,000 professionals from government and industry took over the NBS facilities at the eighth National Computer Security Conference to hear the latest theoretical developments and practical steps being taken to secure the integrity of computer data.

Dennis Branstad, head of the NBS' Institute of Computer Sciences and Technology, noted that interest in computer security has mushroomed recently, prompted by incidents of hackers getting into data bases illegally.

Eight years ago, there were only 250 attendees interested in computer security, and Branstad noted that the issues have changed little since then.

> *"Interest in computer security has mushroomed recently, prompted by incidents of illegal hacking"*

The government is assuming leadership in educating and developing standards in the area of computer security. This leadership role has developed out of necessity, since the government is slated to spend $31 billion in the next five years on general-purpose computers and telecommunications.

Last year, President Reagan established a National Computer Security Center under the control of the National Security Agency and gave it responsibility for "reducing the vulnerabilities" of automated information systems in the federal government.

Col. Joseph Greene Jr., deputy director of the U.S. Department of Defense's Computer Security Center at Ft. Meade, Md., pointed out that access control systems found in commercially available computers are adequate for certain data bases but that generally these systems are not secure enough to protect sensitive information.

According to Greene, there is a need for the development of standards that would be designed into hardware devices.

Greene cited the efforts of the DOD center to build a front-end multilevel encryption device for host-to-host use that will contain features for password keys, key distribution systems and control over access to data bases.

Airline's on-line system grounded

By Maura McEnaney

TULSA, Okla. — A troubled computer system at American Airlines' central data site forced regional reservation offices to do business the old-fashioned way. And for some employees, writing out airline tickets by hand is an ancient and foreign art.

American Airlines' reservations system, which has been automated since the late 1960s, was out of commission for more than seven hours recently after a foul-up occurred during routine file maintenance.

According to an American Airlines spokesman, the problem occurred when the system recoup was not done properly, and new reservation data was written over other current records.

'Caused by human error'

"It was just a one-time mistake caused by human error," American Airlines' Joe Stroop told *Computerworld*.

But that one-time mistake created a bit of chaos at American, forcing thousands of its reservation agents in four centers across the country to handwrite ticket information for more than 30,000 incoming calls.

Reservations were later entered back into American's IBM 9083s after the systems group wrote a software fix to correct the file maintenance problem. A backup system prevented the airline from losing any of its reservations, according to Stroop.

Nine flights delayed

The airline flew 1,300 flights the day of the computer glitch, and nine flights were delayed as a result of the computer problems, he noted.

"It was a frantic time," Stroop said. "When you lose your capacity to work because you lose your automation, No. 1 you are out of practice, and [No. 2], a whole lot of people have to work a lot harder," Stroop said. "We have people here who have never had to write a ticket by hand," he said.

To prevent the problem from happening again, American Airlines now has three operators working on its file maintenance operation and requires each operator to check the work of peers.

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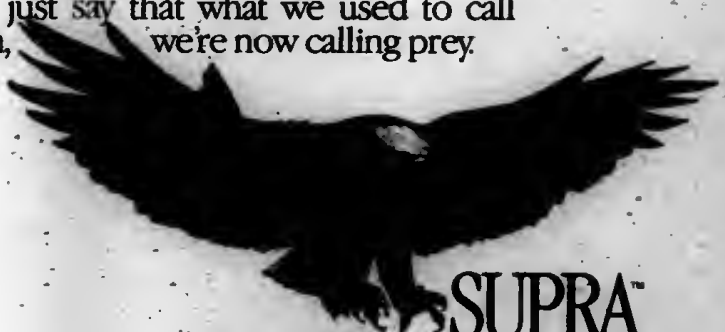

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Airline reduces costs by piloting own maintenance

By Paul Korzeniowski

SAN DIEGO — If you want something done right, do it yourself.

Regional airline carrier PSA, Inc., which has been growing rapidly during the last three years of deregulated competition, has applied that axiom to maintenance of its four Amdahl Corp. V8 mainframes. The results have been a substantial reduction in costs and improved service, according to Arthur Landman, assistant vice-president of computers and telecommunications at PSA, a $700 million airline that primarily serves the Western U.S.

The airline employs an 11-person maintenance staff at an annual cost of $679,000, but Landman figures that the company saves $3.8 million a year in maintenance costs. "Vendors levy as much as a $10,000-a-month maintenance fee for each mainframe," he stated.

In addition to eliminating the monthly fees, other results such as quicker response time and better service have saved PSA money. A vendor's maintenance technician may be responsible for a number of customers' equipment located within an area that may have a 500-mile radius. When a client places a trouble call, 4 to 8 hours may pass before a technician arrives to fix a problem.

In the airline business, an 8-hour delay can be catastrophic. "We have to be up 99.9% of the time at all locations," Landman claimed. "Even if only one of our remote locations goes down, it affects all connecting flights."

Landman claimed that his staff, with technicians in San Francisco and Los Angeles, guarantees 4-hour response time. "In most cases, we arrive within 2 hours," he stated.

Since the staff was put into place in 1981, there has been a 50% reduction in trouble calls. "Most of the calls were repeat calls," the PSA vice-president said. "Vendors had to make three or four trips to a site before a problem was corrected. Our people repair equipment once, and the system stays up and running."

The airline maintains more than just mainframes. Front-end processors, an automatic call distribution system and terminals fall under the aegis of David Allen, manager of field engineering. The responsibility of Allen's group will increase as it takes over maintenance of the company's Memorex Corp. disk drives later this year.

However, there are some items that will remain the responsibility of certain vendors. "We will not take over the maintenance on our [Wang Laboratories, Inc.] equipment," Allen said. "I do not think we would save money because there are too many problems with Wang's printers — they are just not very reliable."

Because PSA services its equipment, purchases are based strictly on cost rather than on cost and service — a practice that often locks an MIS manager into a one-vendor shop. "We spent $85,000 for a used V8 mainframe, and it is a $3 million machine," Landman noted.

Used equipment is one step behind state-of-the-art processors like the recently announced IBM 3090 mainframe. "Newer systems supply nothing other than faster throughput," Landman noted. "If our transactions were straining our processing resources, then we might consider a more powerful system. But that is not the case."

Corporate migraines have also come with maintenance responsibilities. The airline began planning its program in 1980 with the purchase of an Amdahl V6 mainframe. Allen stated that Amdahl had promised to supply traditional support for one year, train PSA technicians and furnish aid to the airline on an as-needed basis after the first year.

Amdahl reneges

After a year, Amdahl reneged on its promises, Allen said, and the airline was forced to turn to a third-party supplier for additional Amdahl equipment. "Our current arrangement is not perfect, and I do not sleep as well as I would if I knew the people who made the machine were available to back me up," Allen said.

Recruiting personnel has presented other problems. "I have tried to hire people through newspaper ads, with little success," Allen noted. Because he has been in the maintenance field for a number of years, most of his staff came through professional acquaintances.

Once PSA technicians are hired, they are sent to the various vendors' technical training programs. "As part of a purchase agreement, we require that the vendor allow our technicians to take its training classes," Landman said.

When the classes have been taken, documentation often holds the key to how well PSA technicians perform. "Most system documentation is quite thorough," Allen noted. "We had [Raytheon Co.] terminals and turned to an outside firm for documentation because Raytheon's documentation was not very good."

Should a company maintain its equipment itself? "On the one hand, it can be scary because, if we fail, there isn't anyone we can blame but ourselves," Landman noted. "On the other hand, we save money, and today there is no vendor able to supply a company with the help it needs."

Many users report service costs more than its worth

By Clinton Wilder

One-third of business minicomputer and mainframe users feel they are receiving less service than they are paying for, according to the recently completed annual survey of user satisfaction by International Data Corp. (IDC) in Framingham, Mass.

Of the 293 users both of hardware vendor and third-party services responding to the survey, 34% said the value of their service was either "somewhat less" or "much less" than its cost. The dissatisfied user figure increased from 30.1% in 1984 and 25.4% in 1983. The percentage of respondents who said their service value was "much less" than its price jumped from 6.6% last year to 11.7%.

"As products show less differentiation in performance levels, service has become a much more important consideration in purchases," said IDC analyst Rebecca Segal, author of the survey. "And value vs. price is our most conclusive measure of customer service satisfaction."

Although the vast majority (88%) of respondents use their vendor's service personnel, the minority — third-party service customers — gave their service companies high marks for value. Seventy percent of third-party customers said their service was much greater, somewhat greater or equal to the price they paid, ranking third-party vendors as a whole behind only Hewlett-Packard Co. (80.7%) and Digital Equipment Corp. (72.7%) in value vs. price ratings.

IBM, however, had the highest percentage, 40%, of responses of "much greater value" or "somewhat greater value" of service in relation to price. "IBM users tend to have the highest expectations and the highest requirements, so that value/price result is encouraging for them," Segal said. But Big Blue also had the most users (20%) who rated its service value "much less" than its price.

Lowest marks

The lowest overall marks for specific vendors went to Prime Computer, Inc. and NCR Corp. Fifty-six percent of Prime users and 51.7% of NCR users rated their vendor's service negatively (less value than cost).

With the exception of HP and Burroughs Corp., most vendors did not fare well in ratings of service response time. Users of IBM, DEC, Prime, Wang Laboratories, Inc. and third-party service staffs said their vendors took longer to respond to normal and emergency service calls in 1985 than in 1984. The response times for Wang service, however, were still considerably below their extremely high 1983 levels (15.9 hours for a normal call and 8.3 hours for an emergency), which Segal said she believes contributed to falling demand for Wang products.

"Now Wang is making some incredible service offers on their VS 300s," she said. "They were significantly hurt by their service rating figures in past years. I think it hurts a vendor more to have a bad service rating than it helps to have a good one."

Burroughs users said they benefited from the industry's shortest average response time — 2.3 hours in normal situations and 1½ hours in emergencies. NCR, despite a lackluster showing in other ratings categories, was rated second with a 2.8-hour normal and 2.1-hour emergency response. Third-party vendors were said to have taken the most time to respond, 16.9 hours on normal calls and 7.3 hours on emergencies. But for third-party users, price was the most important consideration.

One fifth (21.2%) of the users responding to the IDC survey came from manufacturing organizations. Other leading user categories represented were wholesale/retail (12.6%), education (10.9%), government (7.8%), medical (6.8%), banking (6.1%) and data processing services (5.8%).

Software guide out for 1985

The National Technical Information Service in Springfield, Va., has announced that the 1985 edition of the "Directory of Computer Software" is now available.

The directory describes more than 1,300 computer programs developed by 100 federal agencies such as the U.S. Department of Defense, the National Bureau of Standards and the U.S. Department of Transportation. The packages are available to commercial businesses through the National Technical Information Service.

The offerings include an Ada compiler, computer graphics packages, modeling programs and simulation software. The software is divided into 21 categories, including aerodynamics and fluid dynamics, transportation, nuclear science and technology, chemistry, health care, engineering and communications.

The edition lists the hardware and software required to run each program and gives a brief description of its capabilities. The entries are indexed by number, subject, source agency, hardware and language.

The directory costs $40, and there is an additional $3 shipping charge.

Distributed system expands with agency's rapid growth

SCOTTSDALE, Ariz. — When the rapid growth of a nationwide agent for vehicle service contracts rendered the agency's computerized record-keeping system obsolete, the firm cured its growing pains by installing a distributed computer-based system.

In February 1984, Western National Warranty Corp., which sells service contracts to buyers of automobiles, motor homes, travel trailers and motorcycles, was growing at a rate of 10% a month. Paul Askos, president and founder of the 3-year-old firm, explained, "Obviously, we had a prior system, but based on our anticipated growth, that system was becoming obsolete. It no longer had the capacity nor the power we needed. We were unable to generate the accurate statistical data needed to manage the company well."

The firm, which had 10 employees at the time, used an Altos Computer Systems, Inc. 585 with three terminals. The system was used primarily to log a file on every customer and policy, including policy number, customer name and address, name and address of the agent who sold the contract, vehicle information and claim history. According to Askos, the old system had a 32,000-record limit, and by mid-1984, "We had reached that limit," he said. The firm currently has 110,000 policyholders, with 10,000 new policies being written each month, he added.

> *'The system has kept in step with our growth and not hindered it.'*
>
> — Paul Askos
> Western National Warranty Corp.

The firm tackled the problem in June 1984 by installing a Motorola/Four-Phase Systems, Inc. 6300, which was upgraded to a Four-Phase 6600 in July of that year. The system is composed of a 2.5M-byte applications processor, five 37M-byte Winchester hard disk drives and dot matrix and letter-quality printers. According to Askos, the original set-up included four Convergent Technologies, Inc. PT terminals, and the system now supports 16 terminals.

The ability to expand the system was a critical selection factor, Askos said. "One of the intriguing concepts of the Four-Phase 6600 was that it could keep pace with our growth without a huge front-end investment. We have had the system for 18 months and have invested $250,000 in it so far, but our initial bid was less than $100,000. From a financial standpoint, it made sense to buy a system that we could build as we grew," the president of the vehicle service contract firm said.

Western National called in Professional Business Computer Systems, a Scottsdale-based Four-Phase value-added reseller, to assist in the selection, Askos noted. The system, which runs Oracle Corp.'s Oracle data base management software, was installed within five weeks.

The Oracle software is used to handle customer claims that come in over the firm's toll-free WATS line. According to Askos, the process begins when a policyholder takes a covered vehicle to a repair facility where the vehicle is inspected, and an estimate is prepared. The mechanic then calls a Western National adjuster, who brings the customer's contract data up on his terminal.

From there, the Western National adjuster assigns an authorization number if the repair work is covered by the policy. He then gives the mechanic verbal authorization to proceed with the repair, and he later follows this up with a written authorization. When Western National receives the invoice for the repairs, the bill undergoes a complete audit prior to payment.

System cuts WATS bill in half

"The Oracle software is custom-programmed for this application, and it enables us to complete this complicated process in a timely manner," Askos said. The system, he explained, cuts the company's WATS bill in half.

And the system has kept up with the firm's rapid growth. "We handle an average of 200 claims calls per day, using nine full-time adjusters," Western National's president noted. "With that volume, our previous system would have required 14 people to handle the calls effectively."

In addition to the custom-programmed application, the system handles other general business applications, Askos maintained. "We use packaged programs to do standard business tasks, such as word processing and general ledger," he said.

The Oracle software also produces financial status reports in 15 to 20 minutes, Askos noted. Those reports used to take as long as two to three hours to prepare, he explained.

The complete system changeover was not without a few problems, Askos said, but claimed that all of the problems have been solved.

According to Mike Guthrie, software development manager for the value-added reseller Professional Business Computer Systems, one of the problems was a delay in supplying the streaming tape needed to back up the system. This was temporarily solved using 5M-byte Syquest Technology, Inc. cartridges in place of the streaming tape. "This was an inconvenience, but the streaming tape is being installed now," Guthrie explained.

Askos stressed that the system's expandability is critical to his business. "Looking back to when we bought the system, what we saw as our growth potential was a conservative estimate. The system has kept in step with our growth and not hindered it," he said. In 1984, the firm banked $9 million in service contracts, and Askos predicted that it will bring in $15 million in service contracts this year.

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GE glass division sees clear solution to network problem

CLEVELAND — The mandate was clearcut: A group of engineering, marketing and finance professionals at General Electric Co.'s Glass and Metallurgical Products Department was charged with developing a material to market to the medical equipment industry.

The methodology was less simple: Project members were widely dispersed — located in offices at Cleveland headquarters, a second Cleveland manufacturing site and a third facility in Goldsboro, N.C. — and first had to figure out how to communicate effectively among themselves.

Each project member had access to telephones with automatic dialing, an electronic mail system and IBM Personal Computers or compatibles. But communications processes were fragmented, according to Judy Fowler, a GE marketing manager and project manager for the group. "We needed a system that would link us all together," she recalled in a recent interview, "so that we could send messages and computer files easily and quickly."

Several options considered

Among the options that the group's engineers considered were modems and terminal emulation software, desktop voice/data systems and a companywide IBM mainframe that was soon to be installed.

In researching the options, the group's requirements became more clearly defined. Traditional communications and networking solutions were too complex to install, maintain and use. What the group needed was a system that would allow personal computers to communicate with one another as well as connect to the companywide mainframe; provide electronic mail and extras like mail waiting, speed dialing and communications management; and do all of this without undergoing a lot of systems conversion for installation and diskette shuffling during actual operation.

Following its research, the group decided to install a desktop computer phone system from Cygnet Technologies, Inc., of Sunnyvale, Calif., called the Cosystem, which works in tandem with IBM Personal Computers and compatibles.

"The Cosystem performed as touted," Fowler reported. "In one sweep it filled all of our requirements."

Thirteen Cosystems purchased

The department purchased 13 Cosystem units for installation — 11 for the two Cleveland sites and two for the Goldsboro site. Features included a 400-name directory for calls and electronic mail, automatic redialing of a busy number, a speakerphone, a personal calendar and three-way teleconferencing capacity.

It was so easy to learn the system that users were sending messages, loading directories and executing the speed-dialing feature early on the first day of installation, Fowler said.

One initial problem involved sending Lotus Development Corp. 1-2-3 spreadsheet files from one user to another. Fowler said the file first had to be retrieved from a hard disk on the personal computer, copied into a Cosystem subdirectory and then sent to its destination. A letter would take 30 seconds to send in this manner, while a large worksheet might take two minutes. Cygnet's technical support group revised their software to streamline that routing scheme and cut down on the transmission time, Fowler said.

Cosystem's bookmarking features allow the user to enter and leave an application with no systems exits and no diskette changes, Fowler said. "I might be working on Lotus' 1-2-3 spreadsheet when a question comes up. I can interrupt my work and mark my stopping place with a keystroke. Then I can go into my directory for a number, make a call using my speed dialing or send a message by electronic mail and, again in a keystroke, get back into [1-2-3] at the point where I left off," she explained.

One limitation exists

Cosystem does have one limitation, Fowler said. When a personal computer user on a Lotus spreadsheet wants to make an entry into a calendar, the user must sign off Lotus and sign on to the calendar — a 30-second to 1-minute process. "It didn't take all that long, but it is a nuisance," Fowler said. Simply viewing the calendar requires only one keystroke.

Cosystem can also communicate with GE Lighting Business Group central processors; a Honeywell, Inc. time-share system; and a Digital Equipment Corp. VAX-11/780 supermini running VMS.

The VAX contains engineering data for the design of the new products and requires its own compatible terminals or special emulation software. In a link to the VAX, the Cosystem acts as a smart modem and can be configured to transport data in the required form and speed. In this case, the Cosystems have been configured to communicate with both large computers, eliminating the cost of the special terminals, modems and software normally required for VAX.

"It is clear that we had many varied communications needs," Fowler said . "The Cosystem has addressed them in a cost-effective manner."

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NEWS

MANAGERS ON THE MOVE

MEL KESTENBAUM has joined *The Record*, New Jersey's largest evening newspaper, as director of the Information Systems Department.

Kestenbaum comes to *The Record* from McAuto Systems Group, Inc., a division of McDonnell Douglas Corp., where he was general manager/vice-president. He played a major role in the development of the division and its data center.

Prior to that, he managed a corporate data center for Bradford National Corp., acquired by McAuto Systems in 1981.

He holds a bachelor's degree in electrical engineering from City College, New York, and an M.S. in computer science from Pratt Institute, Brooklyn, N.Y.

■

U.S. Department of Transportation (DOT) Secretary Elizabeth Hanford Dole has sworn in JON H. SEYMOUR as the department's assistant secretary for administration.

As assistant secretary for administration, Seymour is responsible for institutional management functions of the department, such as personnel, procurement, data processing, administrative services and management planning.

Seymour served as deputy assistant secretary for administration for approximately two years before his appointment.

He began his government career at the U.S. Department of Justice in 1969, where he held a number of administrative and personnel positions before joining DOT.

A graduate of the University of Virginia with a bachelor of arts degree, he also holds a master of public administration degree from the University of Washington.

■

Grand Union Co. has elected WILLIAM E. KINSLOW as corporate vice-president in charge of management information systems. Kinslow is responsible for the MIS development and the operation of Grand Union's corporate data center in Paramus, N.J.

Prior to joining Grand Union, he was vice-president of corporate and technical services with First National Supermarkets of Windsor Lakes, Conn.

He earned a bachelor's degree in industrial design from the Georgia Institute of Technology in Atlanta.

■

Northrop Corp. has appointed ROBERT W. SLUSSER to the position of vice-president of information resources for the Aircraft Division in Hawthorne, Calif. Slusser will be responsible for automated management systems, data processing, scientific computing systems, enterprise systems and the Advanced Graphite Production Facility.

Slusser joined Northrop Space Laboratories in 1965 as assistant to the director of applications engineering and planning.

He earned his bachelor's degree in mechanical engineering from MIT and a master's degree in business administration from the Wharton School of Business and Finance at the University of Pennsylvania.

Spring 1985 exec directory now available

The spring 1985 issue of the Applied Computer Research, Inc. "Directory of Top Computer Executives" is now available, and several features have been added.

The directory is now published in Eastern and Western regional editions.

In addition, middle-level data processing management positions have been added to each individual listing. These include managers of systems and programming, computer operations, communications and other ties.

Also, it is now possible to purchase minidirectories, or special computer-produced listings of selected individuals or sites.

Examples of minidirectories are all DP shops in a specific ZIP code or a nationwide listing of executives holding a particular title. The minidirectories are available in one- or two-column format, either continuous or bound.

The directory format remains the same, listing installations with annual data processing budgets of $250,000 or more and/or annual revenue of more than $50 million. The current issue lists executives in more than 8,250 data processing installations.

In addition to full names and titles, addresses and phone numbers, the directory lists the makes and models of the computer systems installed in each shop.

Also, industry classification codes are used to identify the specific industry type to which each installation belongs.

The directory is organized geographically, city within state, and a cross-reference index by company name is included.

Applied Computer Research's "Directory of Communications Management" has been integrated with the computer executives' data base and will no longer be published.

The executive directory costs $175 for a single copy and $275 for both issues published in a year.

The Eastern and Western regional editions are available singly at $95 for one issue or $150 for the year.

IF YOU WANT TO SELL BUSINESS SOFTWARE TO THIS COMPANY, YOU BETTER DELIVER.

Flying Tigers® was one of the first companies to see that borderless business software was the wave of the future. Their choice: The company that invented it, McCormack & Dodge. We created Millennium, a family of financial and human resources applications that aren't just borderless in name, but in fact.

Millennium eliminates boundaries between applications, letting you search through large data bases and effortlessly pursue information trails across systems.

Millennium applications are on-line, real-time, integrated with all major data bases. The complete Millennium family includes an interactive PC link and systems development tool.

We are about to deliver Flying Tigers' second Millennium version, Millennium 2.0. Even more advanced than the original. With it we send our thanks for believing in Millennium the first time around.

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CALENDAR

WEEK OF NOVEMBER 10

NOVEMBER 10-13, BALTIMORE — **The Ninth Annual Symposium on Computer Applications in Medical Care (SCAMC).** Contact: Gail Mutnik, Symposium Coordinator, SCAMC, Secretariat: Office of Continuing Medical Education, George Washington University Medical Center, 2300 K St. N.W., Washington, D.C. 20037.

NOVEMBER 11-13, WASHINGTON, D.C. — **The Conference on Software Maintenance — 1985 (CSM-85).** Contact: Donald A. Parker, CSM-85 Publicity Chairman, National Aeronautics and Space Administration, Goddard Space Flight Center, Code 820.1, Greenbelt, Md. 20771.

NOVEMBER 11-15, SAN JOSE, CALIF. — **First International Conference on Computer Workstations.** Contact: Institute of Electrical and Electronics Engineers, Inc. Computer Society, 10662 Los Vaqueros Circle, Los Alamitos, Calif. 90720.

NOVEMBER 12, NEW YORK — **T-1 Carrier Strategies.** Contact: DMW Group, Inc., Seminar Division, 2020 Hogback Road, Ann Arbor, Mich. 48104. Also being held Nov. 20 in Boston and Dec. 3 in Los Angeles.

NOVEMBER 12-15, CHICAGO — **CICS Application Design.** Contact: Sys-Ed Computer Education Techniques, Inc., 35 W. 35th St., New York, N.Y. 10001.

NOVEMBER 12-15, DALLAS — **CICS Command-Level Programming.** Contact: Sys-Ed Computer Education Techniques, Inc., 35 W. 35th St., New York, N.Y. 10001.

NOVEMBER 12-15, DALLAS — **Data Base: A Builder's Guide.** Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402. Also being held Dec. 3-6 in Washington, D.C.

NOVEMBER 12-15, NEW YORK — **CICS Debugging.** Contact: Sys-Ed Computer Education Techniques, Inc., 35 W. 35th St., New York, N.Y. 10001.

NOVEMBER 13-15, NEW YORK — **IMS Utilities.** Contact: Sys-Ed Computer Education Techniques, Inc., 35 W. 35th St., New York, N.Y. 10001.

NOVEMBER 13-15, SEATTLE — **Relational Database Management Systems for Commercial Applications.** Contact: Software Institute of America, Inc., 8 Windsor St., Andover, Mass. 01810.

NOVEMBER 14-15, MCLEAN, VA. — **Federal ADP and Telecommunications Procurement.** Contact: International Data Corp., Washington Division, Suite 240, 1500 Planning Research Drive, McLean, Va. 22102.

NOVEMBER 14-15, SAN FRANCISCO — **Videotex Delivery of Financial Services: On-Line Banking, Electronic Brokerage and Transactional Services.** Contact: Alice Gibons, Inter-Financial Association, 21 Tamal Vista Blvd., Corte Madera, Calif. 94925.

WEEK OF NOVEMBER 17

NOVEMBER 18-19, BOSTON — **Software Tools Conference.** Contact: Suffolk University, Boston, Mass. 02108.

NOVEMBER 18-19, SAN FRANCISCO — **Real Estate Investment Opportunities for Financial Institutions.** Contact: Alice Gibons, Inter-Financial Association, 21 Tamal Vista Blvd., Corte Madera, Calif. 94925.

NOVEMBER 18-19, TORONTO — **End-User Computing: Managing Information Centers.** Contact: Association for Systems Management, 24587 Bagley Road, Cleveland, Ohio 44138.

NOVEMBER 18-22, ARLINGTON, VA. — **Tutorial Week Washington '85.** Contact: Martez A. Camilleri, Institute of Electrical and Electronics Engineers, Inc. Computer Society, 1730 Massachusetts Ave. N.W., Washington, D.C. 20036.

NOVEMBER 18-22, ATLANTA — **The James Martin Seminar.** Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402. Also being held Dec. 2-6 in Philadelphia.

NOVEMBER 18-22, HOUSTON — **Structured Systems Design Workshop.** Contact: Elise Rabalais, Learmonth & Burchett Management Systems, Inc., Suite 405, 2800 N. Loop West, Houston, Texas 77092.

NOVEMBER 18-22, NEW YORK — **CICS Internal Architecture.** Contact: Sys-Ed Computer Education Techniques, Inc., 35 W. 35th St., New York, N.Y. 10001.

NOVEMBER 18-22, SAN FRANCISCO — **Database Management Workshop.** Contact: Elise Rabalais, Learmonth & Burchett Management Systems, Inc., Suite 405, 2800 N. Loop West, Houston, Texas 77092.

NOVEMBER 20-21, ROSEMONT, ILL. — **Network Management/Technical Control.** Contact: Louise Myerow, Registration Manager, CW/Conference Management Group, 375 Cochituate Road, Framingham, Mass. 01701.

NOVEMBER 20-24, LAS VEGAS — **Comdex/Fall '85.** Contact: The Interface Group, Inc., 300 First Ave., Needham, Mass. 02194.

NOVEMBER 21-22, SAN FRANCISCO — **Import/Export Financing for the Small to Mid-Sized Bank.** Contact: Alice Gibons, Inter-Financial Association, 21 Tamal Vista Blvd., Corte Madera, Calif. 94925.

NOVEMBER 21-22, WASHINGTON, D.C. — **PC as a Programmer/Analyst Workstation.** Contact: Software Institute of America, Inc., 8 Windsor St., Andover, Mass. 01810. Also being held Dec. 12-13 in Boston.

IF YOU WANT TO SELL BUSINESS SOFTWARE TO THIS COMPANY, YOU BETTER HAVE IT UP AND RUNNING.

Herman's World of Sporting Goods was one of the first companies to see that borderless business software was the wave of the future. Their choice: The company that invented it, McCormack & Dodge. We created Millennium, a family of financial and human resources applications that aren't just borderless in name, but in fact.

Millennium eliminates boundaries between applications, letting you search through large data bases and effortlessly pursue information trails across systems. Millennium applications are on-line, real-time, integrated with all major data bases. The complete Millennium family includes an interactive PC link and systems development tool.

We are about to deliver Herman's World of Sporting Goods' second Millennium version, Millennium 2.0. Even more advanced than the original. With it we send our thanks for believing in Millennium the first time around.

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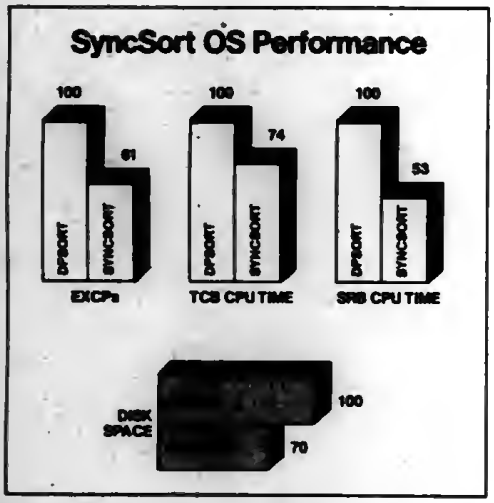

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SOFTWARE & SERVICES

SOFTALK
John Gallant
CW Senior Editor

Productivity key to growth

By John Gallant

"What this country needs is a good five-cent cigar."

— Anonymous

To rephrase an adage — a dangerous practice because it subjects the wisdom of the ages to grave risk — what this computer industry needs is a good, revolutionary productivity tool. Or tools. Or techniques. Or methodologies. Maybe even a magic wand that, once waved, would miraculously increase the productivity of software staffs everywhere.

Faltering productivity is an industrywide problem and one that has received its fair share of national attention. But the productivity problem in the computer sector of U.S. industry is far more critical, and it promises to make its impact felt on other sectors of industry and all of society for many years to come.

For years, pundits have been saying that hardware has become a commodity item. And for years, substantial advances in hardware technology have come along at a fairly predictable clip. Hardware power grows fairly swiftly, and price/performance ratios seem to decline, if not as quickly, at least steadily. Users now buy hardware to fit the software, or at least the potential software applications, they have in mind.

Software has indeed supplanted hardware as the driver of the computer industry. But lately it seems that software's figurative foot is having trouble reaching the industry's gas pedal.

The reason? Designing, developing, testing, implementing and maintaining software are some of the most labor-intensive, time-consuming tasks remaining in the computer age. Users and vendors cannot design software quickly enough. It is as simple and as complex as that. They cannot write it, test it or implement it fast enough. And mainte-

Continued on page 66

When users wed vendors

Groups' independence, equal status key for users

By John Gallant

WASHINGTON, D.C. — The relationship between a software vendor and an independent users group is best described as "like a marriage," according to Richard Accurso.

"There are certain things each party really likes about the other," said Accurso, who is executive chairman of the Software International Corp. (SI) Users Group. "And there are times when you cannot see eye-to-eye. When either party stops listening, the dialogue ends and antagonism begins."

Accurso and his international counterparts, the chairmen of the UK and Australian SI users organizations, spoke about the problems involved in running a users group at the recent 1985 SI Users Group conference. All three agreed that the most important asset a users group can have is independence from the vendor.

"A certain amount of the users group's power is taken away when it is vendor sponsored," Accurso said. "If the group does something that the vendor dislikes, the vendor can use its support as a lever to change things. There are things that occur at our conferences that Software International does not like. But because we are independent, we can continue to do them. The independence puts the dialogue between users and vendor on an equal basis."

"I could not agree more strongly," claimed Laurie West, chairman of the Australian Users of Software International. "The users group should really strive to be

Continued on page 70

IBM upgrades ISPF for MVS, VM/SP units

Along with IBM's recent announcement of new versions of the Professional Office System (Profs) [CW, Oct. 7] was the introduction of enhanced releases of its Interactive System Productivity Facility (ISPF) dialogue manager that include extended national-language support, double-byte character sets, application control support and preprocessed panels for MVS/370, MVS/XA and VM/SP environments.

ISPF is a tool for improving development productivity by manipulating display features and interactive application features. ISPF Version 2 Release 2 enhancements support translations for Danish, French, German, Italian, Spanish, Japanese (Kanji) and Korean (Hanfeul). The preprocessed panel feature is said to reduce the panel-to-panel transition time by allowing users to prepare panel definitions in a preprocessed internal format. The basic license fee for Version 2 Release 2 is $600 for the MVS environment and $500 for the VM environment.

Continued on page 70

- DEC introduced a service that allows users to run programs written in IBM's RPG-II on its VAX systems/**56**
- Through a series of agreements with software vendors, Apollo Computer has made 29 manufacturing packages available for its Domain series workstations/**56**
- Honeywell and Oracle announced that the Oracle relational DBMS is now supported on Honeywell processors/**56**
- SAS Institute said its SAS System software can now be invoked from DEC's All-In-One office software/**62**

Introducing Symphony's micro-to-

It's called Symphony Link.™

And yes, in some respects, it resembles what you've already seen from mainframe developers.

But Symphony Link *is* different.

First of all, Symphony Link is designed from an end-user point of view as well as a data processing point of view. It's an Add-in product designed to work *within* Symphony® software—Lotus'® 5-function management software for the IBM® PC.

Two, Symphony Link isn't just a terminal emulator and file transfer program. It goes well *beyond* that—using an IRMA™ board, it actually integrates mainframe applications into a personal computer (i.e., Symphony) application.

Three, it's an applications development tool.

Four, it's an open-ended product.

Now then. Let's look at the specifics.

Users can bring any 3270 screen directly into a Symphony application.

There is no retyping involved with data capture. That, of course, translates into the obvious benefit of error-free transfer and data integrity.

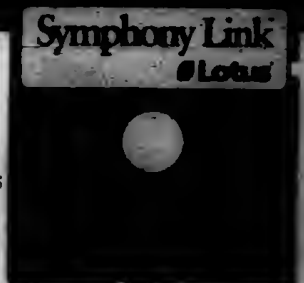
As for data transmittal, whatever data is created off-line within Symphony can be sent screen by screen back to the mainframe using a single, simple set of commands. Naturally, this allows the user to make the best use of host processing time.

Symphony Link uses the standard Lotus interface to transfer files to and from the VM/CMS and MVS/TSO operating environments.

At a user level, the standard Lotus interface enables people to work the way they are accustomed to—an important advantage considering all the capabilities Symphony can provide end-users.

Additionally, because Symphony Link

mainframe link.



utilizes 3270 networking resources and protocols, it requires no network modification.

Two unusual benefits for the data processing manager.

Symphony Link has its own command language which includes 3270 key functions. This lets you customize and control the linking of PCs to your mainframe—even develop applications—all of which helps the end-user work more productively.

Also, Symphony Link is an open-ended product. This allows Lotus to work jointly with mainframe software developers to customize Symphony Link to many mainframe applications (e.g. Gullinet's Information Center Management System™).

How everyone else benefits.

Symphony Link is from Lotus.

Nobody is more committed to developing effective tools for business managers, personal computer users and data processing managers than we are.

Symphony Link, like every other Lotus product, comes with the full service support and training that have become the standard in the industry.

Symphony Link isn't just another emulation product; it isn't just another link product; it isn't, for that matter, just another micro-to-mainframe product.

And that's precisely why you should find out about it. Call (617) 253-9172; outside Massachusetts, call 1-800-554-5501.

Lotus®

Software available for Apollo's Domain

Apollo Computer, Inc. has announced agreements that will make 29 manufacturing software packages available for the Domain System, its 32-bit graphics workstation and local-area network.

The manufacturing packages are designed for discrete and batch manufacturing operations and address applications such as quality control, group technology, process planning, shop-floor data acquisition and control and electronic device and manufacturing process simulation.

The packages include the Stat80 statistical package from Corporate Computer Systems, Inc.; The Manager shop-floor control and factory data collection package from Industrial Computer Corp.; Multiclass, Multitreeve, Multigroup and Multicapp process planning programs from Organization for Industrial Research; and AC/Plan, AC/Data, AC/Diad and AC/GNC production process packages from American Channels, Inc.

Also available is the Dclass menu-driven language for developing manufacturing systems that was developed by CAM Software Laboratory of Brigham Young University; Cutdata, a computerized version of a machining reference book, from Metcut Research Associates, Inc.; the Pisces, Cande, Gemini, Sedan-2, Topix, Supra and Suprem-3 simulation programs for integrated-circuit process and device design from Technology Modelling Associates, Inc.; Slam II and MAP/I simulation language and simulator from Pritsker & Associates, Inc.; and Quality I, Quality Net and Q'script statistical process control packages from Quality Information Systems, Inc.

European versions of the same programs offered by American Channels — dubbed Centre Plan, Centre Data, Diad and GNC — are being offered by Cadcentre Ltd.

All the software is compatible with Apollo's Aegis operating system. Software from Pritsker & Associates and Quality Information Systems is compatible with Aegis and Domain/IX.

Oracle DBMS fit for Gcos

Honeywell, Inc. has announced that Oracle Corp.'s Oracle relational data base management system is now supported under Honeywell's Gcos 6 MOD 400 operating system on the company's 16-bit DPS 6/70 and 6/75 small systems and on its DPS 6/85 and 6/95 32-bit minicomputers.

Dubbed MOD 400 Oracle, the software has been ported by Honeywell and is said to be compatible with Oracle implementations on other vendors' hardware. MOD 400 Oracle is based on Oracle Version 4.1 with an active data dictionary, interactive applications facility, report writer and integrated security and integrity controls.

Optional modules include the MOD 400 program development facility, using embedded IBM SQL statements to enable the Cobol, Fortran and C programming languages to access the Oracle data base. A load facility developed by Honeywell allows interactive data loading of an Oracle data base from a Honeywell DM6 I-D-S/II data base.

MOD 400 Oracle provides a set of utilities and tools to allow users to build their own information systems without traditional programming within the MOD 400 environment. The tools include a user-friendly interface, an Oracle data loader and applications development facilities.

MOD 400 Oracle is available now on DPS 6/70, 6/75, 6/85 and 6/95 minicomputers. Initial licensing fees are $7,975 for the DPS 6/70 and $14,500 for the other systems.

The optional MOD 400 program development facility has initial primary license fees of $5,425 and $9,800 for the DPS 6/70 and the other systems, respectively. The Oracle I-D-S/II load facility carries an initial license fee of $825 on the DPS 6/70 and $1,500 on the other systems.

DEC RPG-II service bows

Digital Equipment Corp. has announced a service that allows users of IBM System/3, System/34 and System/36 minicomputers to transfer application programs written in IBM's RPG-II to DEC VAX systems.

The RPG-II Migration Assistance Service is targeted to provide an alternative for IBM users who need to upgrade to a larger system or add networking capabilities to their minicomputers. RPG-II is installed in an estimated 70,000 sites, a spokesman said.

DEC provides one week of on-site planning assistance, conversion software, a manual and one year of telephone assistance. The price of the service is $15,000 for migration to the Microvax II and $20,000 for migration to the mid-range or larger VAX systems.

Converted RPG programs run under the VAX VMS operating system. The converted programs can run on any size VAX processor without modification, according to a spokesman.

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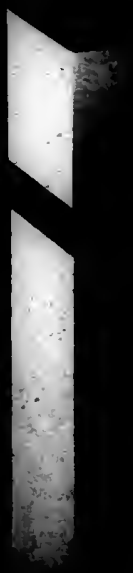

Because they did their homework. They talked to our customers and found out that for over 12 years, hundreds of Fortune 1000 companies have had exceptional results from financial software systems by Data Design.

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Uccel offers management system for Sperry users

Uccel Corp. of Dallas has released the Resource Management System (RMS), a set of five integrated packages for Sperry Corp. 1100 series mainframes that is said to provide management information on data center usage.

The Resource Accounting Module, RMS-1, tracks connect time, storage use and machine cycles. System performance and use statistics are captured by the Workload Capacity Planning Module, RMS-2, according to the vendor.

The Hardware and Equipment Tracking Module, RMS-3, reportedly monitors inventory of data center hardware, remote terminals, personal computers and communications equipment.

Through RMS-4, its Problem Tracking System, the software is said to help managers follow user system or data center problems from initial report through resolution.

The Generalized Graphics System, RMS-5, displays data center information in color charts, the vendor noted.

RMS packages may be purchased separately or together as an integrated system. Individual module prices range from $10,000 to $29,000.

DEC All-in-One users gain access to SAS System tools

SAS Institute, Inc. of Cary, N.C., announced that its SAS System software now executes from Digital Equipment Corp.'s All-In-One office software.

A spokeswoman said that SAS users now have the option of defining the SAS System as a menu option within All-In-One.

The menu-driven interface enables users to access SAS System graphics and analysis capabilities through the same interface used for other office functions.

The All-In-One system works with Version 5 SAS System products including base SAS software for data management, statistical analysis and reporting; SAS/Graph; SAS/AF for interactive applications development; and SAS/FSP for full screen information processing.

The system also works with SAS/OR for project planning and decision support; SAS/ETS for planning, forecasting and financial modeling; and SAS/IML for data analysis and manipulation using an interactive matrix facility.

First-year corporate licenses for base SAS software range from $1,500 to $8,000.

Micro-based HRMS bows

Control Data Business Centers, Inc. of Greenwich, Conn., has announced a human resources management system (HRMS) that integrates microcomputer-based personnel software with its payroll processing services.

Control Data Business Centers has contracted with Mainframe Micros, Inc. of New York to market and sublicense its HR-1 personnel application system as part of the complete HRMS.

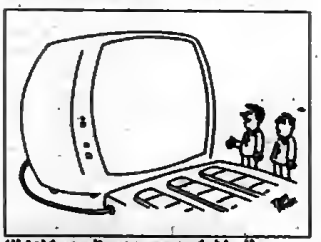
HR-1 uses the Revelation data base manager by Cosmos, Inc. of Seattle. Revelation requires an IBM Personal Computer, Personal Computer XT or AT with a minimum of 512K bytes of memory, a hard disk and an 8087 math coprocessor chip.

HRMS links HR-1 to Control Data Business Centers' Payroll 4, a processing service that runs on IBM 4300 mainframes, using its Orchestrator micro-mainframe link software.

HRMS is said to provide storage of more than 500 data elements on each employee with unlimited historical records, audit record and multilevel security, standard and ad hoc reports and a review allowing retrieval of salary, performance and other information.

There are 35 data elements that will automatically post from HR-1 to the payroll system and 108 user-defined data elements that will flow from the payroll service to the personnel file.

HRMS is available for $18,500, including installation and training. It is also available on a monthly basis for $1,200 plus a monthly maintenance fee based on the number of employees. There are also monthly fees for payroll processing.



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Report requests of various levels of complexity were run against single and multiple databases. Eighteen separate test runs were conducted, with PC/FOCUS averaging 45.2% faster than dBase III,™ and 40.0% faster than R:Base™ 5000.

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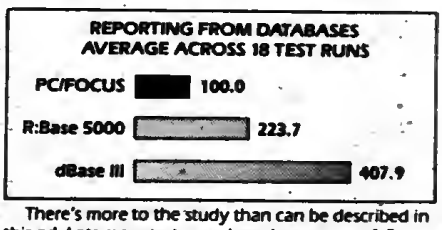

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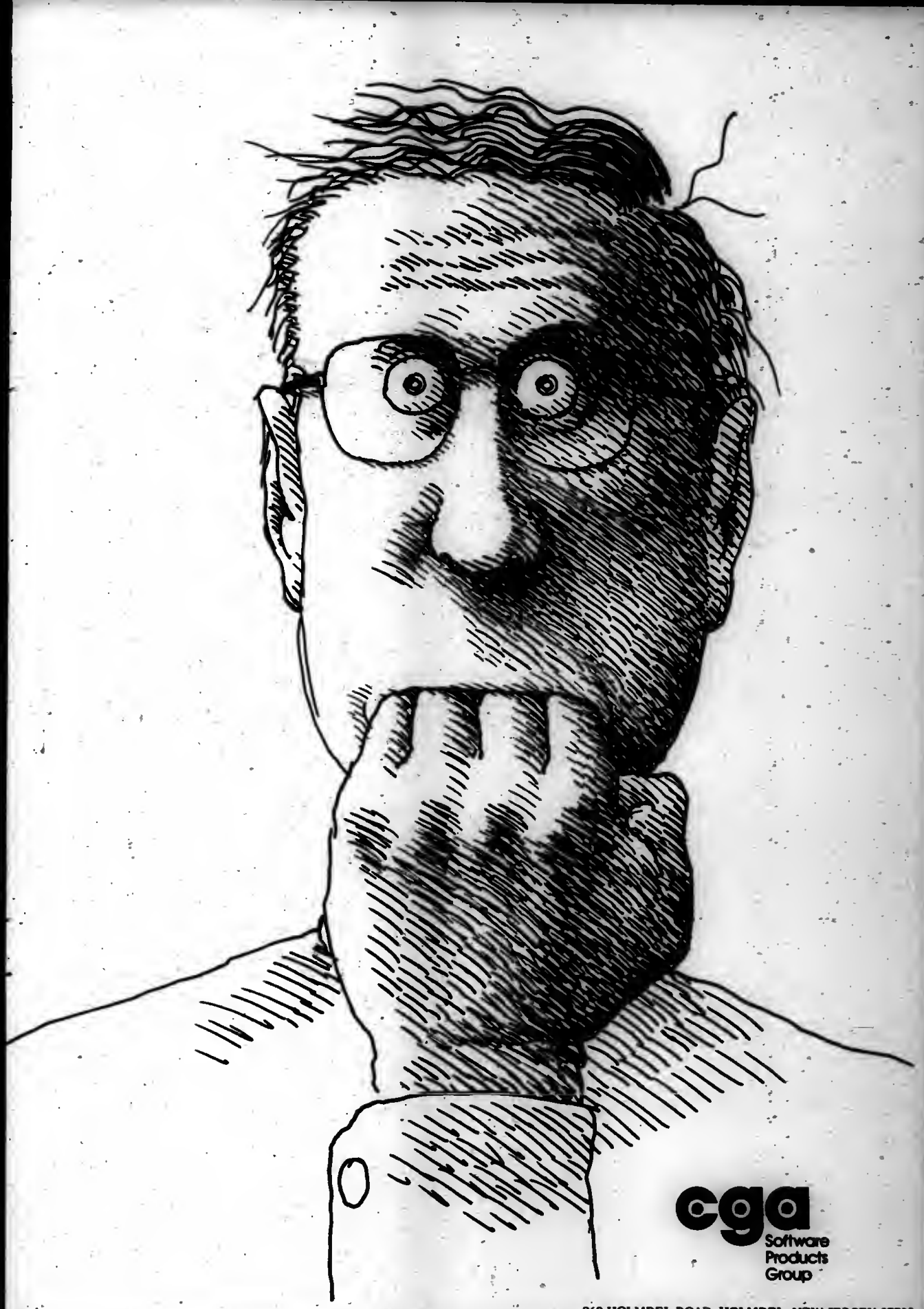

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Stratagem version bows

Boston-based Integrated Planning, Inc. has announced the Screenmaster option in Version 5 of its Stratagem IBM mainframe decision support system.

Screenmaster allows users to gain interactive access to mainframe information through menu-driven commands. More experienced users can bypass the menus to work at command level. Screenmaster also includes a screen painting facility and a full screen data editor.

The screen painter lets users develop custom terminal screens for data entry and executive information systems. Information can be entered anywhere on a blank screen, and programmed function keys let users to add information as a field and to give fields attributes like color, highlighting and security protection.

The full screen editor allows users to manipulate data on the screen while protecting field names. Programmed function keys control scrolling across as well as up and down the screen.

Strategem runs on IBM mainframes under VM/CMS and MVS/TSO. It also works with Digital Equipment Corp. VAX and Prime Computer, Inc. Primos-based processors. Existing users of Stratagem will receive Version 5 at no cost. The Screenmaster option costs $10,000. The IBM version of Stratagem with Screenmaster is priced at $95,000.

From page 55

Productivity key to growth

nance, well, maintenance is a sadder story altogether.

Consider that anywhere from 50% to 75% of the software professionals at work today — valued and scarce employees whose talents could be directed toward producing new systems that address vital business functions — spend their time just keeping old software systems plodding along. And each passing day distorts the ratio of developers to maintainers, and not in a favorable manner.

Not meeting needs

Those systems are already running on computers. They are not meeting new needs, nor are they prompting users to buy any more iron, so to speak. New applications meet new needs and consume new hardware.

But who's going to build them?. And with what? If users continue to rely on the same tools, an ever smaller number of new applications will be built.

But even those few new systems will join the ranks of those that must be maintained, and the ratio described above shifts even more unfavorably.

Deadly cycle?

Sound like a deadly cycle? It is. What's more, it doesn't seem likely to be broken in the near future. It seems that the revolutionary software advance, the one that will provide a feasible method for drastically increasing systems development productivity, is always out of reach.

What about all the so-called productivity tools available today? Good question. While the vendors must be lauded for their efforts, it seems there is no single product that can solve the problem. Each approach has its flaws or limits.

There are no standards among tools such as fourth-generation languages; many productivity products take their toll in machine performance (although, admittedly, that has become less of an issue), and there is little portability among the systems developed with said tools. In terms of maintenance of existing systems, users agree that the products to help with that task just aren't out there.

End-user computing

OK, how about end-user computing? Come on. End users, with the help of some fourth-generation languages, report writers, spreadsheets or query tools, may happily draft a quick report, design a small program or draw together some statistics in a presentable format.

But the average end user cannot and will not in the forseeable future build the sophisticated software systems that U.S. business is going to need to compete and survive in the future.

Well, there is always artificial intelligence. Not so. The promise of AI will be quickly stilled if users and vendors cannot find a rapid way to build the incredibly complex systems that AI proponents envision.

Heart of AI is software

The heart of AI is software, not Lisp machines or parallel processors. And AI software developers will suffer the slings and arrows of outrageous fortune that their earlier systems predecessors suffered.

Perhaps the problem lies in the insistence by users and vendors that all advances in software be evolutionary in nature. Vendors are so concerned with locking down their users and users so concerned with what already exists that revolutionary changes — the kind of changes that must happen if the computer industry is to smash the productivity barrier — are virtually inconceivable.

It seems clear that if users and vendors continue along the same software path they stride today, the near future will see a vast chasm between the potential of hardware and the stunted reality of software. A lot of promising changes will be lost forever in that chasm.

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DATA INTEGRITY

HENRY FORD TO CREATE A FOUR-

Although we're told that saddlemakers were all for the idea, and submitted some rather startlingly innovative ideas, breeding the perfect family horse just didn't seem right to Mr. Ford. His mind took a different tack, a new line of thought. A line of assembly. A whole new approach to providing people with a way to get from where they were... to where they wanted to go.

A whole new approach. That seemed like an excellent starting point for a relational database. We did not want to simply rewrite an arcane programming language or rework an old mainframe database.

Our goal was to create a relational database that would, for the first time, really combine power and ease-of-use. And we wanted to bring you that combination no matter what your application requirements or computer sophistication.

The goal has been achieved. If power and ease-of-use seem to be a paradox you've heard before but never seen, you should know our name is Paradox."

Paradox brings what used to be the contradiction of power and ease-of-use together in several concepts.

First, Paradox brings an easy-to-use Lotus-like standard menu together with a powerful way to interact with the information in your database. With Paradox you simply type in an example of the information you seek, rather than having to write a line-by-line program to do things like join different tables or do calculations.

Second, Paradox brings a rather revolutionary new concept to personal computer technology. Known in artificial intelligence circles as "machine reasoning," Paradox uses this feature to evaluate your request and, *on its own*, writes a program for you that seeks the answer in the fastest possible way. Paradox then exe-

DIDN'T SET OUT -PASSENGER HORSE.

cutes this program and produces the answer. You don't need to know how the information is organized, how to best approach the problem or how to write a program.

The advantages of these features, aside from being rather fascinating we think, are incredible speed, an easy-going experience and a real opportunity to do more with a database than ever before.

If all of that sounds terrific but you're concerned about "driver's education," don't worry. The familiar Lotus-like menu is only one of many ways we've made Paradox easy to use. You'll hum right along.

There's a lot more we'd like to tell you about Paradox (which explains the very last paragraph), but you've really got to see it. All of this may give you that "easier said than done" feeling, when in truth, it's now "easier done... than said." We hope you'll visit your computer retailer and see it all for yourself.

You'll see a lot more than just an improved breed. You'll see a whole new way to handle data on the IBM® PC line, the Compaq® line and other 100% compatibles. A new way to get where you want to go with power and ease. We started from a clean base and now, it seems, we've left the others in the proverbial dust. Paradox. The Base of Departure.™

Part of the "lot-more" we'd like to tell you: Easy importing and exporting of data from Lotus 1-2-3,™ Symphony,™ dBASE II,® dBASE III,™ PFS:FILE,® VisiCalc® and ASCII / Complete report generator / Scripting (macros) with Paradox memorizing key strokes and commands as you go / Our own full-featured application programming language / Forms that you can design / Unlimited number of tables, each up to 260 million characters.

PARADOX.™
Relational Database

THE BASE OF DEPARTURE.™

From page 55

Independence, equal status key for users

on a friendly footing with the vendor, but it has to remain totally independent if it is to have any impact."

D. J. Batts, chairman of the M.M.S. User Group, the UK equivalent of the SI Users Group, said the most difficult problem his group faces is that it deals with an agent of SI and not the vendor itself. "Thus, the things we really push for are not so much enhancements to the products as improvements in the service we receive from the agent," Batts said. "We cannot apply the same pressure on SI that the U.S. group can. But we can influence the distributor to service our products better, to provide additional hardware support and to modify the documentation for UK users."

Accurso said approximately 40% to 50% of the proposed changes his organization's product-specific working groups submit to SI ultimately get incorporated as enhancements to the company's packages. Although satisfied with that level of responsiveness, Accurso said the dialogue between the two parties could improve in the area of enhancements.

"There are steps that could be taken to smooth the process out," he said. "For example, we would like a little more acknowledgement of why certain proposals are not folded into the products as enhancements. We document the reasons for our proposals very carefully, and we think they should document their responses as clearly. That is, after all, the whole basis of our relationship — understanding."

All user-suggested enhancements are forwarded to SI, Accurso said, although committee members prioritize them according to their importance for the vendor. "You have to do that," West said. "A group that is always pushing for changes that are just 'nice to have' rather than important is not going to be effective."

Bylaws should be carefully drafted

When asked what advice they would offer others considering forming a users group, the chairmen agreed that the bylaws governing committee and conference operations should be carefully drafted to ensure a sound structure. They also advised beginners to follow the steps taken by other successful users group founders and, above all, to keep the organization's structure as simple as possible.

West said users should follow the Kiss principle. "Keep it simple, stupid," West said. "You cannot hope to accomplish everything on day one."

But, Accurso cautioned, fledgling users groups should not be afraid to tackle new challenges. "You have to try new ways of doing things. Some of the efforts fail, some succeed beyond what you would have imagined."

At the recent SI Users Group conference in Washington, D.C., Software International officials lauded the group's efforts and said that many of the capabilities of the company's recently unveiled Masterpiece series applications grew out of proposed users group enhancements. Accurso appreciated that recognition.

"We believe that the stronger the vendor, the better off the users will be," Accurso said. "We are trying to help SI become stronger."

From page 55

IBM upgrades ISPF for MVS, VM/SP units

IBM also announced ISPF Program Development Facility Version 2 Release 2 (ISPF/PDF) for MVS/370, MVS/XA and VM/SP environments. The new releases provide the same national-language support and features such as Browse and Edit that are said to simplify frequently performed programming tasks.

ISPF/PDF also includes library support that eases maintenance and tracking of different versions and levels of program segments. Full screen context editing that allows multiple additions and changes to a screen from one transaction with the host system is also included. The basic license charge for ISPF/PDF is $3,500 for MVS and $3,290 for VM. The VM version has an optional one-time charge of $9,500.

IBM also announced the following:

- A redefining of System Modification Program Extended to include the MVS Custom-Built Installation Process Offering and enhanced to include the MVS Custom-Built Product Delivery Offering The enhancements enable users to install function and program temporary fix service on existing MVS systems.
- The Series/1 Event Driven Executive Remote Manager (EDX/RM) to allow Series/1 processors to be managed and controlled by the Communications and Systems Management programs available on IBM hosts. EDX/RM Version 1.1 includes enhancements that provide communications and systems management support for all Series/1 processors in a communications network through a single connection to an IBM host.

EDX/RM features include downstream support, enabling those processors that have one or more Series/1 between them and the IBM host to fully interact with host communications and systems management programs; software alerts, for reporting program checks and system checks to the host; and dynamic data set extents support, for automatically extending the size of a data set as more records are added. The one-time charge of EDX/RM is $2,000.

- EDX Communications Facility Version 2.1, which includes support for the Series/1-PC Channel Attachment feature and Series/1-PC Connect program, software for supporting high-speed communications links for network access to disks and printers. The program costs $2,500.

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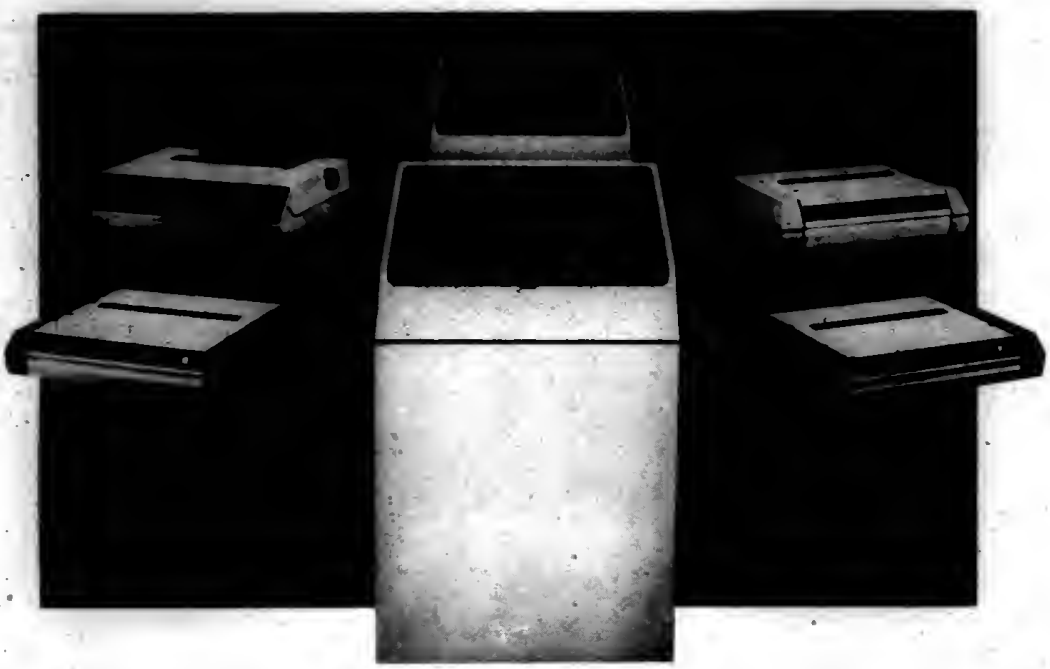

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IN DEPTH

Is your DBMS really relational?

Rule Zero: For any system that is advertised as, or claimed to be, a relational data base management system, that system must be able to manage data bases entirely through its relational capabilities.

By E. F. Codd

The originator of the relational model for data base management presents basic principles for determining how relational a DBMS product is — a question that faces many buyers today because almost every vendor claims its DBMS is relational. Some vendors may not realize how far from the mark they are.

Part 1

In recent years, the data base management system market has undergone a very rapid swing in favor of products that take the relational approach to data base management. It is hard to find a vendor that does not claim its DBMS is relational. This swing has been so extensive that some vendors of nonrelational DBMS have quickly (and recently) added a few relational features — in some, cases, very few features — in order to be able to claim their systems are relational, even though they may not meet the simple requirements for being rated "minimally relational." We shall refer to this kind of DBMS as "born again."

It is a safe bet that these Johnny-come-lately vendors have not taken the time or manpower to investigate optimization techniques needed in relational DBMS to yield good performance. This is the principal reason they continue to proclaim the "performance myth" — namely, that relational DBMS must perform poorly because they are relational!

One consequence of this rapid swing of the market to the relational approach is that products that are claimed by their vendors to be relational DBMS range from those that support the relational model with substantial fidelity to those that definitely do not deserve the label "relational," because their support is only token.

Some vendors claim that fourth-generation languages will provide all the productivity advantages. This claim conveniently overlooks the fact that most of these languages do little or nothing for shared data (the programming language fraternity

E. F. Codd is the originator of the relational model for data base management. He was the leader of the team that designed and implemented the first operating system with multiprogramming capability. Currently he is president of The Relational Institute and the Codd & Date Consulting Group, both based in San Jose, Calif.

still does not appear to realize that support for the dynamic sharing of data is an absolute requirement). In addition, there is no accepted theoretical foundation for fourth-generation languages and not even an accepted, precise definition.

This article outlines a technique that should help users determine how relational a DBMS really is. Accordingly, I shall discuss the following:

- The fidelity of DBMS to the relational model.
- The fidelity of the proposed Ansi SQL standard to the relational model.
- Conclusions regarding choosing a DBMS product.

I shall not attempt a complete description of the relational model here — a relatively brief and concise definition appears in the article "RM/T: Extending the Relational Model to Capture More Meaning," (Chapter 2, "The Basic Relational Model") in the Association for Computing Machinery's "Transactions on Data Base Systems" (December 1979). It is, however, vitally important to remember that the relational model includes three major parts: the structural part, the manipulative part and the integrity part — a fact that is frequently and conveniently forgotten.

In this paper, I supply a set of rules with which a DBMS should comply if it is claimed to be fully relational. **No existing DBMS product that I know of can honestly claim to be fully relational,** at this time.

> *The fidelity of the proposed Ansi standard to the relational model is even less than that of some relational DBMS products. However, the standard could be readily modified to be more faithful to the model, and pressure should be brought on Ansi to do so.*

The proposed Ansi standard does not fully comply with the relational model, because it is based heavily on that nucleus of SQL that is supported in common by numerous vendors. Moreover, it takes a static, schema-based approach to data base description — reminiscent of Codasyl — instead of specifying a comprehensive, dual-mode data sublanguage that provides the powerful yet easy access to relational data bases and that is unique to the relational approach. Thus, the fidelity of the proposed Ansi standard to the relational model is even less than that of some relational DBMS products.

However, the standard could be readily modified to be more faithful to the model, and pressure should be brought on Ansi to do so. In fact, vendors are advised to extend their products soon in these respects so that they support customers' DBMS needs more fully and avoid possibly large customer expenses in application program maintenance at the time of the improvement.

The 12 rules

Twelve rules are cited below as part of a test to determine whether a product that is claimed to be fully relational is actually so. Use of the term "fully relational" in this report is slightly more stringent than in my Turing paper (written in 1981). This is partly because vendors in their ads and manuals have translated the term "minimally relational" to "fully relational" and partly because in this report, we are dealing with relational DBMS and not relational systems in general, which would include mere query-reporting systems.

However, the 12 rules tend to explain why full support of the relational model is in the users' interest. No new requirements are added to the relational model. A grading scheme is later defined and used to measure the degree of fidelity to the relational model.

First, I define these rules. Although I have defined each rule in earlier papers, I believe this to be the first occurrence of all 12 of them together.

In rules eight through 11, I specify and require four different types of independence aimed at protecting customers' investments in application programs, terminal activities and training. Rules eight and nine — physical and logical data independence — have been heavily discussed for many years.

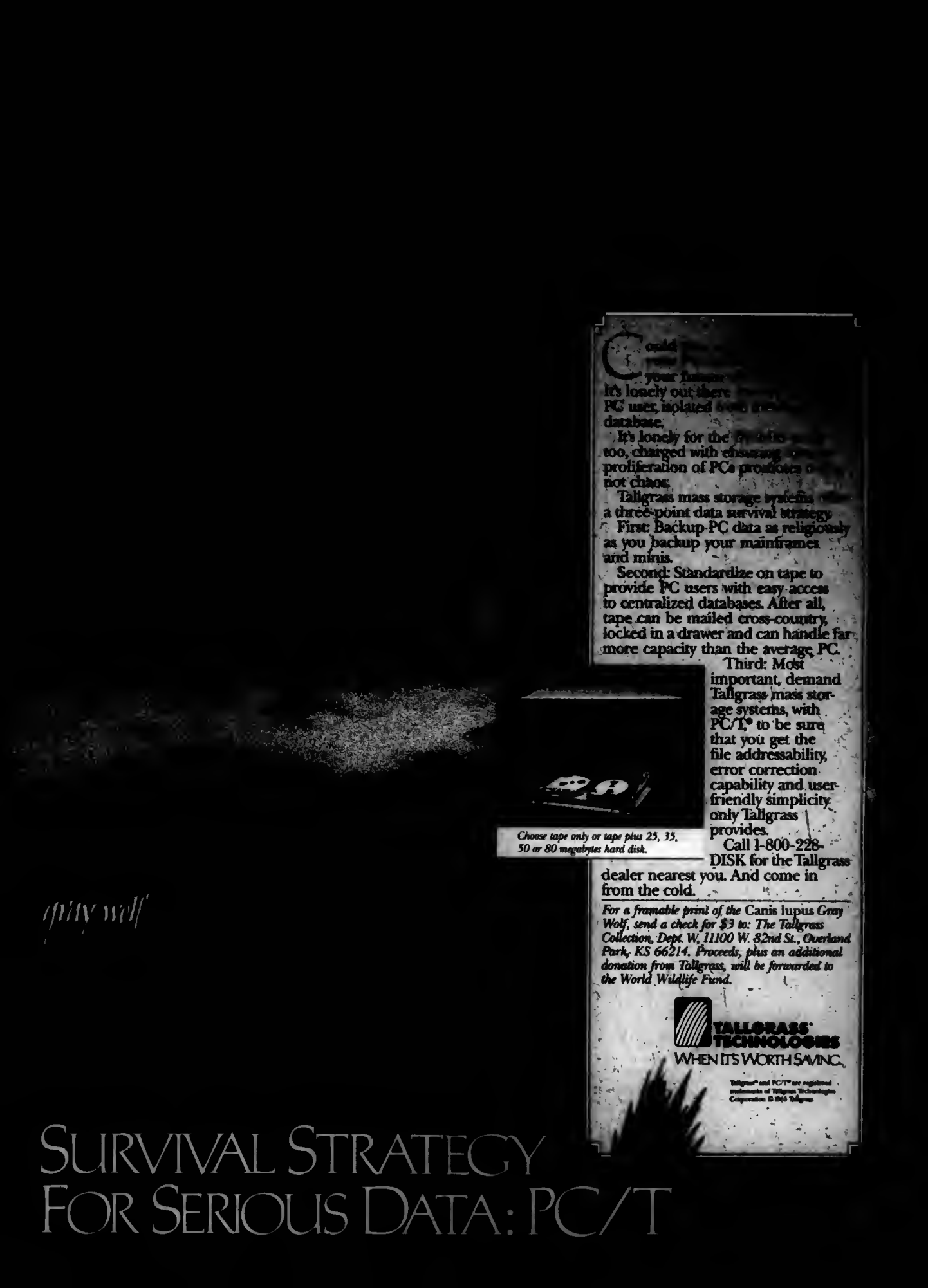
Rules 10 and 11 — integrity independence and distribution independence — are aspects of the relational approach that have received inadequate attention to date but are likely to become as important as eight and nine.

These rules are based on a single foundation rule, which I shall call Rule Zero:

For any system that is advertised as, or claimed to be, a relational data base management system, that system must be able to manage data bases entirely through its relational capabilities.

This rule must hold whether or not the system supports any non-relational capabilities of managing data. Any DBMS that does not satisfy this Rule Zero is not worth rating as a relational DBMS.

One consequence of this rule: Any system claimed to be a relational DBMS must support data base insert, update and delete at the relational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level (multiple-record-at-a-time). Another consequence is the necessity of supporting the information rule and the guaranteed access rule.

"Multiple-record-at-a-time" includes as special cases those situations in which zero or one record is retrieved, inserted, updated or deleted. In other words, a relation (table) may have either zero tuples (rows) or one tuple and still be a valid relation.

Any statement in the manuals of a system claimed to be a relational DBMS that advises users to revert to some nonrelational capabilities "to achieve acceptable performance" — or for any reason other than compatibility with programs written in the past on nonrelational data base systems — should be interpreted as an apology by the vendor. Such a statement indicates the vendor has not done the work necessary for achieving good performance with the relational approach.

What is the danger to buyers and users of a system that is claimed to be a relational DBMS and that fails on Rule Zero? Buyers and users will expect all the advantages of a truly relational DBMS, and they will fail to get these advantages.

Now I shall describe the 12 rules that, together with the nine structural, 18 manipulative and three integrity features of the relational model, determine in specific detail the extent of validity of a vendor's claim to have a "fully relational DBMS."

All 12 rules are motivated by Rule Zero defined above, but a DBMS can be more readily checked for compliance with these 12 than with Rule Zero.

> Rule 1: *All information in a relational data base is represented explicitly at the logical level and in exactly one way — by values in tables.*

The information rule.

Rule 1: All information in a relational data base is represented explicitly at the logical level and in exactly one way — by values in tables.

Even table names, column names and domain names are represented as character strings in some tables. Tables containing such names are normally part of the built-in system catalog. The catalog is accordingly a relational data base itself — one that is dynamic and active and represents the metadata (data describing the rest of the data in the system).

The information rule is enforced not only for user productivity but also to make it a reasonably simple job for software vendors to define additional software packages (such as application development aids, expert systems and so on) that interface with relational DBMS and, by definition, are well integrated with the DBMS.

That is, these packages retrieve information already existing in the catalog and, as needed, put new information in the catalog by the very act of using the DBMS.

An additional reason to enforce this rule is to make the data base administrator's task of maintaining the data base in a state of overall integrity both simpler and more effective. There is nothing more embarrassing to a data base administrator than being asked if his data base contains certain specific information and his replying after a week's examination of the data base that he does not know.

Guaranteed access rule.

Rule 2: Each and every datum (atomic value) in a relational data base is guaranteed to be logically accessible by resorting to a combination of table name, primary key value and column name.

Clearly, each datum in a relational data base can be accessed in a rich variety — possibly thousands — of logically distinct ways. However, it is important to have at least one way, independent of the specific relational data base, that is guaranteed, because most computer-oriented concepts (such as scanning successive addresses) have been deliberately omitted from the relational model.

Note that the guaranteed access rule represents an associative addressing scheme that is unique to the relational model. The rule does not depend at all on the usual computer-oriented addressing. However, the primary key concept is an essential part of it.

Systematic treatment of null values.

Rule 3: Null values (distinct from the empty character string or a string of blank characters and distinct from zero or any other number) are supported in fully relational DBMS for representing missing information and inapplicable information in a systematic way, independent of data type.

To support data base integrity, it must be possible to specify "nulls not allowed" for each primary key column and for any other columns where the data base administrator considers it an appropriate integrity constraint (for example, certain foreign key columns).

Past techniques entailed defining a special value (peculiar to each column or field) to represent missing information. This would be most unsystematic in a relational data base because users would have to employ different techniques for each column or domain — a difficult task because of the high level of language in

use (and a task that I believe would decrease user productivity).

Dynamic on-line catalog based on the relational model.

Rule 4: *The data base description is represented at the logical level in the same way as ordinary data, so that authorized users can apply the same relational language to its interrogation as they apply to the regular data.*

One consequence of this is that each user (whether an application programmer or end-user) needs to learn only one data model — an advantage that nonrelational systems usually do not offer (IBM's IMS, together with its dictionary, requires the user to learn two distinct data models).

Another consequence is that authorized users can easily extend the catalog to become a full-fledged, active, relational data dictionary whenever the vendor fails to do so.

Comprehensive data sublanguage rule.

Rule 5: *A relational system may support several languages and various modes of terminal use (for example, the fill-in-the-blanks mode). However, there must be at least one language whose statements are expressible, per some well-defined syntax, as character strings and that is comprehensive in supporting* all *of the following items:*

- *Data definition.*
- *View definition.*
- *Data manipulation (interactive and by program).*
- *Integrity constraints.*
- *Authorization.*
- *Transaction boundaries (begin, commit and rollback).*

The relational approach is intentionally highly dynamic — that is, it should rarely be necessary to bring the data base activity to a halt (in contrast to nonrelational DBMS). Therefore, it does not make sense to separate the services listed above into distinct languages.

In the mid-'70s, the Ansi Standards Planning and Requirements Committee generated a document advocating 42 distinct interfaces and (potentially) 42 distinct languages for DBMS. Fortunately, that idea has apparently been abandoned.

View updating rule.

Rule 6: *All views that are theoretically updatable are also updatable by the system.*

Note that a view is theoretically updatable if there exists a time-independent algorithm for unambiguously determining a single series of changes to the base relations that will have as their effect precisely the requested changes in the view. In this regard, "update" is intended to include insertion and deletion as well as modification.

High-level insert, update and delete.

Rule 7: *The capability of handling a base relation or a derived relation as a single operand applies not only to the retrieval of data but also to the insertion, update and deletion of data.*

This requirement gives the system much more scope in optimizing the efficiency of its execution-time actions. It allows the system to determine which access paths to exploit to obtain the most efficient code.

It can also be extremely important in obtaining efficient handling of transactions across a distributed data base. In this case, users would prefer that communications costs are saved by avoiding the necessity of transmitting a separate request for each record obtained from remote sites.

> Rule 4: *The data base description is represented at the logical level in the same way as ordinary data, so that authorized users can apply the same relational language to its interrogation as they apply to the regular data.*

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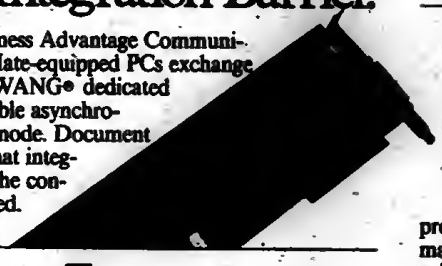

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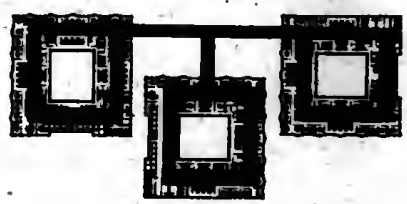

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Physical data independence.

Rule 8: Application programs and terminal activities remain logically unimpaired whenever any changes are made in either storage representations or access methods.

To handle this, the DBMS must support a clear, sharp boundary between the logical and semantic aspects on the one hand and the physical and performance aspects of the base tables on the other; application programs must deal with the logical aspects only.

Nonrelational DBMS rarely provide complete support for this rule — in fact, I know of none that do.

Logical data independence.

Rule 9: Application programs and terminal activities remain logically unimpaired when information-preserving changes of any kind that theoretically permit unimpairment are made to the base tables.

Take the following two examples: splitting a table into two tables, either by rows using row content or by columns using column names, if primary keys are preserved in each result; or combining two tables into one by means of a nonloss join (Stanford University and MIT authors call these joins "lossless").

To provide this service whenever possible, the DBMS must be capable of handling inserts, updates and deletes on *all views* that are theoretically updatable. This rule permits logical data base design to be changed dynamically if, for example, such a change would improve performance.

The physical and logical data independence rules permit data base designers for relational DBMS to make mistakes in their designs without the heavy penalties levied by nonrelational DBMS. This, in turn, means that it is much easier to get started with a relational DBMS because not nearly as much performance-oriented planning is needed prior to "blast-off."

Integrity independence.

Rule 10: Integrity constraints specific to a particular relational data base must be definable in the relational data sublanguage and storable in the catalog, not in the application programs.

In addition to the two integrity rules (entity integrity and referential integrity) that apply to every relational data base, there is a clear need to be able to specify additional integrity constraints reflecting either business policies or government regulations.

Assume the relational model is faithfully reflected. Then, the additional integrity constraints are defined in terms of the high-level data sublanguage and the definitions stored in the catalog, not in the application programs.

Information about inadequately identified objects is never recorded in a relational data base. To be more specific, the following two integrity rules apply to every relational data base:

Entity integrity. No component of a primary key is allowed to have a null value.

Referential integrity. For each distinct nonnull foreign key value in a relational data base, there must exist a matching primary key value from the same domain.

If, as sometimes happens, either business policies or government regulations change, it will probably become necessary to change the integrity constraints. Normally, this can be accomplished in a fully relational DBMS by changing one or more of the integrity statements that are stored in the catalog.

> Rule 11: *A relational DBMS has distribution independence.*

In many cases, neither the application programs nor the terminal activities are logically impaired.

Nonrelational DBMS rarely support this rule as part of the DBMS engine, where it belongs. Instead, they depend on a dictionary package, which may or may not be present and can readily be bypassed.

Distribution independence.

Rule 11: A relational DBMS has distribution independence.

By distribution independence, I mean that the DBMS has a data sublanguage that enables application programs and terminal activities to remain logically unimpaired:

- when data distribution is first introduced (if the originally installed DBMS manages nondistributed data only);
- when data is redistributed (if the DBMS manages distributed data).

Note that the definition is carefully worded so that both distributed and nondistributed DBMS can fully support Rule 11. IBM's SQL/DS and DB2, Oracle Corp.'s Oracle and Relational Technology, Inc.'s Ingres (all nondistributed in present releases) fully support this rule.

This has been demonstrated as follows: SQL programs have been written to operate on nondistributed data (using System R) run correctly on distributed versions of that data (using System R*, the IBM San Jose Research Laboratory prototype), and the distributed Ingres project at the University of California at Berkeley has shown the same capability for the Quel language of Ingres.

It is important to distinguish distributed processing from distributed data. In the former case, work (for example, programs) is transmitted to the data; in the latter case, data is transmitted to the work. Many nonrelational DBMS support distributed processing but not distributed data. The only systems that support the concept of making all the distributed data *appear* to be local are relational DBMS — these are prototypes right now.

In the case of a distributed relational DBMS, a single transaction may straddle several remote sites. Such straddling is managed entirely under the covers — the system may have to execute recovery at multiple sites. Each program or terminal activity treats the totality of data as if it were all local to the site where the application program or terminal activity is being executed.

A fully relational DBMS that does not support distributed data bases has the capability of being extended to provide that support while leaving application programs and terminal activities logically unimpaired, both at the time of initial distribution and whenever later redistribution is made.

There are four important reasons why relational DBMS enjoy this advantage:

- **Decomposition flexibility** in deciding how to deploy the data.
- **Decomposition power** of the relational operators when combining the results of subtransactions executed at different sites.
- **Economy of transmission** resulting from the fact that there need not be a request message sent for each record to be retrieved from any remote site.
- **Analyzability of intent** (owing to the very high level of relational languages) for vastly improved optimization of execution.

Nonsubversion rule.

Rule 12: *If a relational system has a low-level (single-record-at-a-time) language, that low level cannot be used to subvert or bypass the integrity rules and constraints expressed in the higher level relational language (multiple-records-at-a-time).*

In the relational approach, preservation of integrity is made independent of logical data structure to achieve integrity independence. This rule is extremely difficult for a "born-again" system to obey because such a system already supports an interface below the relational constraint interface. Vendors of "born-again" systems do not appear to have given this problem adequate attention.

(Part two: the practical consequences of the 12 rules and an evaluation of certain products against the relational model.)

IN DEPTH

A walk through The Computer Museum with GORDON BELL

The Computer Museum occupies a spacious converted warehouse on Boston's waterfront, facing a preserved wooden schooner and a series of glass and steel skyscrapers. The blending of old and new in the cityscape serves as a perfect backdrop to the museum, which contains both the relics of a machine age gone by and examples of technologies still under development.

The Computer Museum houses the world's largest collection of computer industry artifacts. C. Gordon Bell helped found The Computer Museum at Digital Equipment Corp., prompted by his deep involvement in the computer industry and a fear that all the interesting artifacts would be destroyed.

Bell earned his B.S. and M.S. degrees from MIT in the 1950s and worked as a DEC engineer from 1960 to 1966, witnessing an "exponential growth" in computer installations. During this time, Bell forecast the impact of home computers and saw his chance to make it happen. Preferring the challenge of larger machines, he instead engineered the PDP-5, -8 and -11 and helped set the standard for interactive computing.

Bell then went to Carnegie-Mellon University from 1966 to 1972, which in his words was "perfect timing — the beginning of the integrated circuit generation when things were moving slowly" in industry. He returned to DEC in 1972 to build the first VAX and bring in a new generation of minicomputers.

After serving four years on the museum's board of directors, Bell has now retired to become a permanent trustee. The museum now flourishes under the directorship of his wife, Gwen, and Bell has begun a new project. In July 1983, Bell founded Encore Computer Corp. with fellow minicomputer giants Kenneth Fisher of Prime Computer, Inc. and Henry Burkhardt of Data General Corp. Encore seeks to challenge the industry with yet another generation of powerful small computers.

Bell gave Associate Features Editor Amy Sommerfeld a guided tour of the museum, giving his own comments on the exhibits along the way.

In a way, The Computer Museum is just like a computer. We had a prototype to test whether it was a good idea and what the clientele would be. Only DEC employees and customers visited the museum when it first opened.

The Museum started up at the DEC facility in Marlboro [Mass.] in September 1979. It was totally DEC-sponsored, not public, although three-quarters of the artifacts were made by other companies. A lot of time was spent debugging what to show about the machines and what to say about them, namely: What's the achievement? Why is it here?

Then we solicited "customers," and in June '82 went public with a board of directors. We solicited members and became, in effect, a production model. The second production model is The Computer Museum here at Museum Wharf.

The Hollerith Tabulator, used in the 1890 US census

> *One hundred years from now I want people to come here and say, "Gosh, I'm glad they saved all that stuff." By then they'll understand that information processing is one of the fundamentals of society.*

The goal of the museum as I saw it was to collect the first object of a given class, the last object of a given class and then the important ones — the classics. The fun is trying to find out: When is something going to be classic? When is something going to be the first one? I always tried to err on the side of collecting more — ones that I thought were really going to be important.

At the entrance to The Computer Museum stands Whirlwind, an experimental computer started in 1945 at MIT that eventually yielded the first core memory. Only one model of this 16-bit computer was ever produced; it operated from 1950 to 1959.

Whirlwind was the first real-time and control machine. It's here in part because it was the origin of the machines that came out of the New England region. It's a classic mini — as big as a house — and it has lots of firsts, including parallelism and real-time, interactive I/O.

Whirlwind was a controversial project because the machine took longer than they thought it was going to take to build, and they spent quite a lot of money doing it. But once it was up and people started using it, then everyone began to see the benefits of having a fast machine like this and what it could do compared with the traditional [John] von Neumann-style calculating machines of the time.

MIT conceived Whirlwind as a simulator for aircraft stability. That was one of the reasons it ended up with a short word length. Machines that were being built around this time tended to have 36- to 40-bit word lengths, according to von Neumann's guidelines. Whirlwind's engineers built a 16-bit computer because that was all the precision they needed. All the other machines were serial and slow, while this one was parallel and very fast.

One feature of experimental machines is that you never know exactly what you're going to get out of them. The MIT/Forrester patent for core memory came out of this project. The standard Williams tube memory in use at the time was so unreliable that the Whirlwind designers said, "We've got to have a new memory." Core memory was first tested on the Memory Test Computer [MTC], which [DEC President] Ken Olsen engineered. The MTC ran for about a month. The memory operated so well that the engineers just took it right out and put it on Whirlwind.

Around the corner sit several large pieces of equipment that together make up the U.S. Air Force's AN/FS Q-7, developed by Jay Forrester and Robert Everett of MIT's Lincoln Laboratory. Installed in 1958 and decommissioned in 1983, the 32-bit Q-7 ran longer than any other computer, and was the first to serve 100 simultaneous users.

Whirlwind also ended up being the prototype for the Semi-Automatic Ground Environmental [Sage] air defense system computer, called Whirlwind 2. Later, IBM built it under the name AN/FS Q-7. MIT helped design the architecture and the circuits, and then IBM built these massive vacuum-tube machines. This was a 32-bit computer, designed to do everything Whirlwind could do and more.

It was a lovely machine because it had two 16-bit words that could be operated on in parallel. Each pair used 55,000 vacuum tubes and took 150,000W of power. The machine you see here in the museum was decommissioned only two years ago, in February 1983, and still ran at a phenomenal 99.95% uptime because of careful design and an absolutely controlled environment.

Notice the way it's built — a constant stream of air blows on each tube. Every tube is running at the same temperature. In addition, the users did something called "marginal checking," which meant they varied the voltages up and down to detect whether a tube was going to fail. By the time this machine was built, its designers really understood how to build very high-reliability computers.

On a museum field trip, we saw the AN/FS Q-7 before it was decommissioned. People operated

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From the perspective of 25 years in the industry, the chief engineer of DEC's PDP-11 and cofounder of Encore Computer Corp. points out the winners, the losers and the classics.

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the computer from this console of lights and switches. Today you can't see what's happening on a computer, but in the early days of computers there was a light on every bit.

You flipped switches to compute data, and you could see everything that was happening inside the machine. If the machine stopped or you wanted to run it slowly, clock by clock, you could see the whole state exactly.

I have programmed in machine language, bit by bit. In fact, until you get that first level of software on machines, you have to operate all machines bit by bit.

Core Memory Unit 2 from the U.S. Air Force's AN/FS Q-7

Core Memory Unit 2 from the AN/FS Q-7 stands 6 feet tall. It was considered a very fast memory: Any word in the Q-7's core memory could be accessed in 6 msec.

This refrigerator-size cabinet holds half of an arithmetic unit. This memory was one of IBM's contributions to the project. It stored only 4K by 32 bits — 131,000 bits, or one half of today's 256K-byte chip, which as you know is a very small fraction of the size. Later, they had a 64K-byte version, but this was really quite a small memory. That's why they needed all the drum units, which were used to swap programs with core. To show you the scale, each of these large drum units equals roughly one small floppy — about 256K bytes.

Getting rid of all the poor memories and switching over to core was a major transition. It occurred in the late '50s, even though the core was first operational in '53. It took that long to get core into other machines.

Cores hit the market simultaneously with transistor circuits, and that occurred almost precisely in 1960 — the beginning of the second generation of computing.

The year 1960 was a wonderful year, when a tremendous number of classic machines came out. Many were transistorized, and they all had core memories. That year was the beginning of serious computing. Reliable machines, relatively inexpensive, fast machines and good memories.

That's what really made computing start to grow exponentially.

For many Americans, computers in the 1950s were synonymous with Univac. "That marvelous electronic brain" was first introduced to the general public by CBS newscaster Walter Cronkite during the 1952 presidential elections.

This is the Univac 1 that the Eckert and Mauchly company built. It really was the first commercial computer. When I say "first," I have to be careful, particularly saying the "first commercial." There were a couple of computers already operating in England, such as the Leo computer, but it's very hard right now to pin down when those were actually shipped.

When you say "first" you're asking, "When was it that a customer had it in his site, actually using it?" You have to read all the fine print.

For many Americans, "Univac" was synonymous with "computer."

There were 46 of them, which at the time was massive volume! The price was about $930,000 initially, and it declined over time.

The way to really see machines is to see how they were used at that time. The films the museum preserves and shows are really important for just this reason. They show, for example, what key punching was really like or how Eniac was used. Here's the first film on programming, and the first AI film and one on the introduction of Fortran. We also have a film made for the museum just when the last IBM Stretch was taken out of service.

The museum has a videotape of Walter Cronkite talking about the first time Univac predicted the 1952 election results. During the election, there was concurrent reporting about the election and the computer's handling of it. I remember there was a very different attitude than you see today, when everyone says, "Computers have really fouled up elections. Computers shouldn't be allowed to predict results because that will influence the voters," and so on.

The response then was amazement, absolute amazement: "How can this thing know what's going to happen after only a few hours?" The film the museum has of Cronkite's announcing doesn't quite match the amazement of the moment.

This machine was literally telling us what was going to happen. In fact, it seemed so eerie that the networks were refusing to use the results at first. The computer made an early prediction, and the networks didn't even put it on the air until later on because they just didn't believe it.

Museum visitors can operate this card punch and automatic sorter.

Several exhibits show the evolution of card I/O technology, from the original semiautomatic sorters in solid oak cabinets through the standard automatic sorters still found in universities nationwide to the final models of the card era. A small pile of tiny 96-column cards remains from IBM's System/3. They never caught on, and IBM introduced the first floppy disk the following year.

I was fortunate enough not to deal with cards much. I did one year as a Fulbright scholar and used cards all year. I swore I would never punch another card.

Then I went to Carnegie-Mellon University in 1966 as a professor, and they had an IBM machine with cards. I decided to write a book instead of computing — there was no way I was going to put cards in a hopper again!

I was spoiled. I had just built the first time-sharing machine at DEC, so I really didn't believe in batch processing at all. All the DEC machines were interactive, and we believed in having people talk directly to computers.

> *Technology is a driving devil. It conspires, and if there's a concept half-there or a computer half-designed, technology will complete it.*

But the general level of user-friendliness was still quite low at that point. The Apollo Guidance Computer here was used in the first Apollo space vehicle in 1962. Unfortunately, somebody took a piece off it, so we had to cover the console with plexiglass.

Below it, a [Hewlett-Packard] 150 computer performs the same function as the Apollo. When people play with it now, they say, "Oh, this is awful. The human interface is terrible." We answer, "Yeah, that's the way it was!" They ask, "How did they ever really control the spacecraft?" With great difficulty!

Also while I was at Carnegie-Mellon in the early '70s, I went to a seminar on IBM's minicomputer. It was odd — they had a System/3, and on it was this card reader with these little, nonstandard cards IBM was introducing. And I thought, "Oh my God, don't they know? Cards are dead!"

What happens in every technology is somebody tries to make the ultimate version, and it's an absolute disaster. These cards are a perfect example. Just when it was clear that there was no use or need for cards, they introduced these new 96-column cards. If they weren't as big, the logic went, you could have a smaller card reader and it could be cheaper. That was all the little cards had to recommend them.

The trick in any technology is knowing when to get on the bandwagon, knowing when to push for change and then knowing when it's dead and time to get off.

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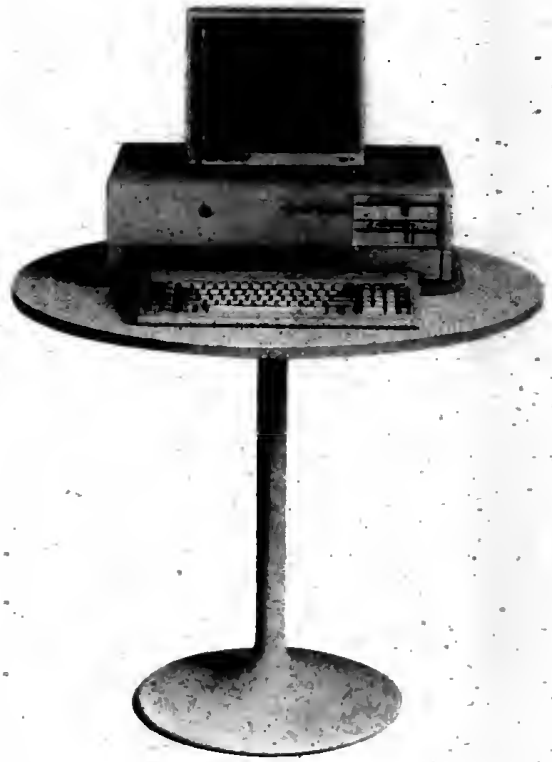

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That's getting on the right bandwagon. The other trick is not to get on any wrong wagons.

The Viatron 21 terminal is an example of getting on too early. Viatron introduced a CRT, a processor, a keyboard — a whole data entry device for $40 per month, which was absolutely unheard of. A $1,600 device in 1968! The museum has a copy of the advertisement that ran in *The Wall Street Journal*.

This was one of the famous fiascos in selling. The company went public and sold stock, and the stock prices went out of sight because of this revolutionary data entry device. The problem was it was too early. You couldn't build it using the MOS technology they had then. They sold thousands, but they couldn't deliver any! The technology was too immature.

IBM's nonstandard punch cards were quickly abandoned.

A glass case packed full of artifacts — components, posters, books and sketches — fills one wall of the museum.

The purpose of this exhibit is to mark a period, 1950 to 1959, and to show a range of firsts, from basic technology to applications. The exhibit shows a complete census of all the machines installed by 1950.

As time went by, you can see there was an exponential buildup of computer installations. About 10 machines were installed during '51. They were all prototype machines. Twice that number were installed in '52 and twice that number again in '53.

There's another theme that's important. A time period of approximately 12 or 13 years shows up over and over again in the development of computing. It shows that things really don't change that fast. For example, it took that long to get the transistor into computers in full scale.

In this museum case lies the patent for the first point-contact transistor, which was filed in June 1948. By 1960, all the machines were transistorized, but that was a full 12 years from the invention of the device. Twelve years of hard work and production so you could produce the transistor, so people understood them, so the circuits got done and so on. It just took that long.

In 1959, the Noyce patent was filed on a new way to build transistors — the planar process. That was the beginning of the integrated circuit, but they weren't really produced until '67 to '68 — sort of a half-cycle. On the other hand, IBM's first integrated circuit computers didn't appear until 1973. That's a full 14-year gap.

In 1960, as the exhibit shows, there was an incredible number of new machines introduced, marking the second generation: the Control Data Corp. 1604 and 160, the beginning of CDC; General Precision's new machine; Sperry Rand's solid-state machine, Univac; Philco's transistor machine that put the company at the forefront; IBM's workhorse, the 1401, plus the 7070 and 7090, a real classic; and the DEC PDP-1, the beginning of DEC.

These machines formed the basis for the next 10 years of computing.

That was also the time when I said, "We're not going to have any more modified, kludgy typewriters on our computers." The next machine I designed had a Teletype on it. The next one after that was when we started using the ASR33.

We were the first ones to adopt the ASR33, which turned out to be a major product in marketing minicomputers. For $750 you could include a keyboard, a printer, a paper tape reader and a paper tape punch. Basically, we'd scaled the I/O problem down to something trivial. That's how DEC was able to introduce the PDP-8 at the $18,000 level, because we didn't have to charge $5,000 for a paper tape reader and punch.

In the same case, artifacts from the Atlas project include only a single board and a magazine article about the breakthrough by engineers in England.

Another fascinating introduction during this early period was Atlas, designed at Manchester University. I saw it in '61 and the museum has

some artifacts from it. Atlas was the first virtual memory machine, using paging.

Again, the 12-year time delay for a major product introduction: Atlas came out as a research machine in '61, but Manchester's first machine ran in '49. It took them that long to find that two-level store is what you want as a programming environment. DEC started building computers in '60, and by '73, we had a good virtual memory on the PDP-10. We were building minis — or what became minis — in 1966, and the PDP-11 had a good virtual memory on it by '78, when VAX was introduced — 12 years again.

In the semiconductor arena, the first processor on a chip was done in '71, and there still isn't a really good virtual memory microprocessor. National Semiconductor Corp. had a good chip set (the 32000) by '83, but they're really just delivering it now.

The idea of paging was written up in about five papers. The whole need and motivation for it was totally described by 1962. Anyone who had any feeling at all for computers could look at the concept and say, "Oh yes, this is the way you have to structure memory."

I don't know why it's taken so long to realize the concept. One thing is, all these industries — mainframe, mini and micro — are somewhat independent of one another, and it's unclear whether they learn from each other.

In fact the PDP-6, which was the first time-sharing machine and came out in '66, was designed for Lisp, because Lisp came out in 1959-60. I was convinced Lisp was really going to take over, but it's taken 25 years to catch on. It's amazing how long it's taken to get to a point where people really see the virtue of it. Lisp really is the most elegant language.

Unix was first developed in reaction to [General Electric Co.'s] Multics, and it was implemented on a PDP-9 and then on a PDP-11. Then when we built the VAX, we got [AT&T Unix developer] Ken Thompson to do a Unix critique on the VAX. We asked, "Can you run Unix really well on it?"

People always perceived this war between DEC and Unix, and that isn't the case. I certainly tried to make sure VAX was the best Unix machine. AT&T was a super customer, and I believed that Unix was going to take on about the position it has taken on, simply because of the open architecture and portability aspects it has.

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The glass case also contains handwritten notes from some of the industry's leading technologists.

The work for An Wang's core memory was done in '48 and '49. This is a shift register that he built for the Harvard Mark IV, which stored 64 bits of data, and those are his notes — beautiful notes.

I think there's a good story here. Wang himself is a scientist-engineer, and I really believe you have to have that kind of leadership to build technological companies. Wang Laboratories is an excellent example of a strong company with a technically oriented leader.

DEC is another good example. Ken [Olsen] was involved in the MTC at the outset and went on to work on Whirlwind, then TX-0. Apollo [Computer, Inc.] was started by very strong technologists. CDC, Cray [Research, Inc.] and many others have very strong technological roots.

But the company that's the most amazing to me in every respect, of course, is IBM. To me, IBM is a two-culture company: the very strong group that runs engineering/manufacturing and the field organization that markets their machines. [Thomas J.] Watson [Sr.]'s incredible drive for excellence set the tone.

The interesting thing is that a marketing person runs the company. To me that's a real exception. It's very difficult for a nontechnologist to run a technology company, independent of whether it's computers or bioengineering or any other field. If the technology is moving at all fast, then management has to be able to make decisions based on what's going on in the technology.

Apple [Computer, Inc.], for example, I consider more of a marketing phenomenon. With the exception of the Macintosh, I don't really regard Apple as a technology company, because the Apple I and Apple II weren't so much technological innovations. The first personal computer is right here at the museum, and it's not an Apple. A lot of companies had built small machines at the time.

Personal computers of all shapes and sizes crowd the PC Gallery. Whereas many regard the personal computer as a relative newcomer, some of these machines have the look of old-guard computers.

In the PC Gallery we have one of the Lincs [Laboratory Instrument Computers] that came out in '64 and which I think of as the first personal computer or scientific workstation. It had a personal filing system, keyboard and interactive display, and it was transportable. It cost about $40,000. Linc marked the beginning of a line of computers that included the Linc-8 and PDP-12 for personal, scientific and interactive computing. There are still Lincs in use.

Linc has all the attributes of a personal computer. It's for one person, it's interactive, you can go automatically from program definition to execution without any intermediate paper tape or cards or anything like that. But the main thing is it was used by one individual.

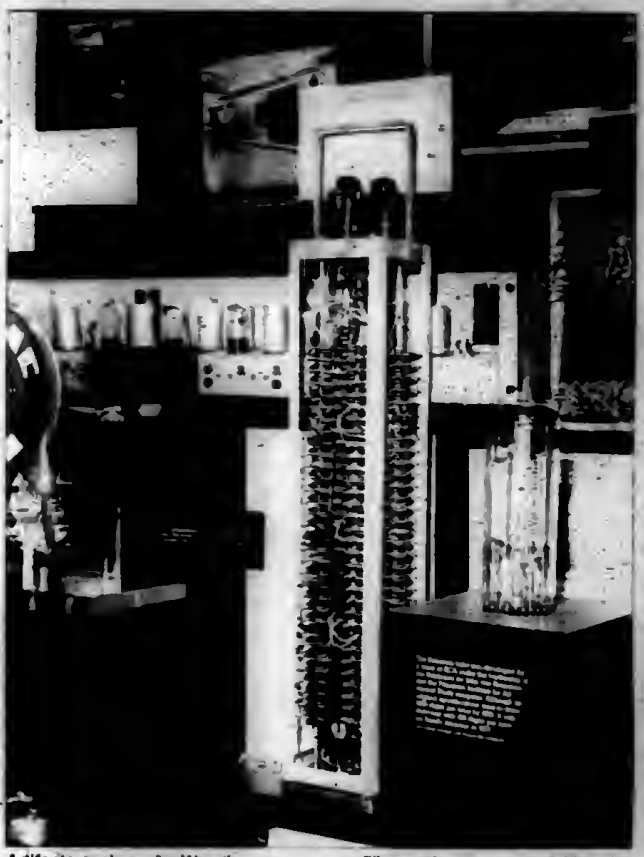
I think the issue of defining a personal computer is really one of scale. How much are you going to pay for a computer for one person? And what does it do?

The purpose of this exhibit is to display things you can't see in stores or in schools. It includes the first personal computers, like Linc and Altair, Apollo's first workstations and other artifacts. All the machines should have their skins off, their insides exposed. Computerland's Bill Millard, who is on the museum's board, has given a grant to collect and to enhance the exhibit. The main thing is to have a definitive, scholarly collection.

From the outset, personal computers were driven by memory technology. In 1975, a 4K memory chip was introduced, and the Altair was built using first a 1K and then the 4K chip. In 1978, the 16K chip was quickly incorporated into the Apple II. In 1981, the IBM Personal Computer came out using the new 64K chip, and then in '84, the 256K chip begot the Personal Computer AT and the Macintosh.

Furthermore, I don't believe anyone really invented the personal computer. "Invention" is too strong a word for it. A lot of things are called inventions when, actually, they were inevitable. I believe technology is a driving devil. It conspires, and if there's a concept half-there or a computer half-designed, technology will complete it.

In retrospect, for example, I don't look at the microprocessor as an invention. It was something we were



Artifacts such as An Wang's core memory fill two glass cases, marking the periods 1950 to '59 and 1960 to '69.

A personal computer gallery displays all shapes and sizes.

all trying to do for a number of years. One day the technology reached a point where it could be done. In this case, it was a conspiracy between a good chip and adequate memory.

Apple happened to be the first to put that combination into a machine. I don't want to discredit them totally and say, "Oh, they were just a bunch of assemblers." They did a very nice job: The Wozniak disk controller was a very neat little piece of logic. But it was the 6502 processor, the 16K-byte memory chip and that disk controller that conspired, along with the idea of open architecture, in the first Apple computer.

Apple did a very neat job in pulling the pieces together and packaging the computer. If you read all of [Steve] Jobs' accounts, he really worked on the packaging. The key decisions were the user interface and good bit-map graphics. But I can show you all that same work at a laboratory at Xerox Corp.'s [Palo Alto Research Center] four or five years earlier. It was just waiting to happen.

I'm strictly an evolutionist. Get an idea and keep working on it. In the computer industry, we're not idea-limited now, it's just a question of pulling the ideas together. The machines that we can build now with the new technology are fantastic. We're anticipating machines that will execute 100 million to 1K million instructions per second.

The Computer Museum honors Seymour Cray with his own exhibit, titled "A man and his machines." Museum curators name Cray the "undisputed leader in the design of the most powerful computers."

Cray has built the world's fastest computers for 20 years. That's absolutely amazing! He has also produced an incredible string of ideas and basic technology. The reason he has been able to stems from his breadth, starting with the basic physics of the devices, of cooling, of wiring and computation . . . on into knowing how to build a compiler and operating system.

If you look at Cray and what he's done, you end up with a lesson on how to stay out of organizations. People get sucked into them. Cray stayed out of large organizations: first at CDC, by getting out of Minneapolis and going to Chippewa Falls, Wis. It was far enough away that people weren't coming to visit him all the time. He couldn't go to meetings.

He could never have built the 6600 In Minneapolis, I'm convinced. And then as Cray Laboratories grew, he must have seen the same thing happening again and said, "Gee, I've got lots of organizational responsibility, and the way to handle that is to split myself off again."

Organizations, no matter how tenuously connected, all start sucking up your time, and basically people don't have enough time for both computers and organizations.

In this case, if you look at the Cray-CDC split from CDC's standpoint, the tragedy was letting him go, not being able to give him the environment he needed. But maybe it was inevitable. There's a discomfort that settles in with certain individuals in large companies. You suddenly see that it's really you who are supporting the company.

> ***A small crew is a prerequisite for designing really good machines. That's the nature of great computers — it isn't always the people with the most resources who succeed.***

The Cray exhibit is dominated by the hulking remains of the first CDC 6600. Introduced in 1963, the 6600 was a product of Cray's Chippewa Falls lab and ran three times faster than IBM's Stretch.

CDC's 6600 No. 1 — a Cray brainchild — is preserved here. When the 6600 was announced, I remember being just awestruck by it. I put it with Atlas as one of the greats. In the development of ideas and projects at that time, these two stood out from everything else.

IN DEPTH/COMPUTER MUSEUM

A section of the Cray 1 on display.

The 6600 represents special creativity in a number of aspects: It executed many instructions simultaneously, and they were all interlocked. Cray had the idea of separate I/O computers and, of course, his [reduced instruction set computer (Risc)] architecture. For the 6600, they had evolved the circuitry enormously. This was the fastest machine running at the time, with a very respectable clock time even by today's standards — almost a 40-MHz clock. The 6600 was also the first machine to employ Freon cooling.

I love [IBM President Thomas J.] Watson Jr.'s comment about the Cray 1 announcement in '63, posted here: "I understand that in the laboratory developing the 6600 there are only 34 people, including the janitor. I fail to understand why we have lost our industry leadership position by letting someone else offer the world's most powerful computer." That says it all!

And in fact, having a small crew is another prerequisite, I think, for designing really good machines. That's the nature of building great computers — it isn't the people who have the most resources all the time who succeed. I think while you are designing and building, you can't deal with the complexity that a large organization implies. It's very hard to segment the work and design all the interfaces so the design comes out right with a large crew.

To me, that's always been a challenge when you're building something large — to develop an architecture that will let the work be partitioned separately and independently among a number of groups. You want to get as many good ideas into the design as possible, yet not thwart it by the complexity of having every project member have to talk to every other one.

That's why I really believe in a strict, levels-of-integration model for segmenting work. That is, we work in very well-defined layers, starting from silicon or semiconductor devices up to hardware systems, operating systems, languages and then generic applications. Each layer has to be very cleanly structured so team members can build and develop them independently.

In a videotape the museum shows of Cray at Livermore National Laboratories, he talks about the size of the design team. He says his ideal number is one. Then he goes up to about six, each of whom leads one level, and then a layer of workers. Then he goes up to the next step, getting to about 30 in a hierarchy. But there's got to be not more than three or four who really understand the whole. That's assuming you've got one person who can lead the project and understand everything from semiconductors to applications.

The museum's collection includes production Model 17 of the PDP-8, introduced in 1964 at $18,000. The PDP-8 was designed by Edson de Castro (now president of DG) and engineered by Gordon Bell as an outgrowth of the PDP-5.

The PDP-8 was the first minicomputer. The reason it can be called a minicomputer is that it was built small enough to fit in a cabinet, and therefore it became a component to other systems. Furthermore, it was fast and easily mass-produced. The PDP-5, its predecessor, came out about two years earlier. It was the forerunner of the PDP-8, but I don't classify the PDP-5 as a minicomputer simply because no one integrated it with other systems.

The PDP-8 was implemented in a number of other technologies. By 1978, it was on a single chip that Intersil [Systems, Inc.] built. In fact, the number of sales of the PDP-8 has been higher in the last three or four years than at any other time because it's inside a word processor — the Decmate. So this one machine has lasted 20 years. Not bad!

The PDP-10 is also now about 20 years old. The PDP-11 was introduced in 1970, and later the VAX-11 was created to extend the PDP-11's range. There are still a lot of PDP-11s being sold, but VAX has really overtaken it as the main revenue source at DEC.

I personally made a decision in 1975 not to work on the first personal computer. I could see it was going to be quite a machine. But I went to work on the VAX instead, which to me was a much more fascinating engineering problem.

I wrote a memo in 1969 when I was at Carnegie-Mellon, urging a strong effort in home computers. It outlined the whole home computer industry essentially the way it has evolved. I have never been that interested in the smaller machines. Having worked on the PDP-8, I've always gravitated toward larger, more complex computers.

If I had decided the other way, I probably would have tried to build personal computers within DEC. In fact, DEC had a number of early

personal computers, but the company just never marketed them.

At the time, the organizational model rejected the cost structure, the culture — everything about personal computers. The organization at DEC was aimed at a certain kind of machine, and anything that didn't fit that model didn't fly.

DEC actually did put a number of PDP-8s in people's homes. I had a time-sharing terminal in my home in 1966. Our children grew up programming on a terminal. For a long time it was a curiousity. Guests would ask; "What do you do with this thing? Why would you want one?"

The semiconductor gallery includes junked semiconductor boards, a 1970s rubylith mask and several important chips under a 50X microscope: a Mostek 4K-byte random-access memory, an IBM 64K-byte RAM, an NEC Corp. 256K-byte RAM and a DEC Microvax II processor chip.

I think the semiconductor industry people will throw everything away if we don't stop them. It's important to preserve their revolution because it's really been the basis for ours.

This exhibit gives a close-up of another lesson in technology. I feel the Microvax II is the best microprocessor chip or chip set made. It includes a one-chip VAX, a floating-point chip and memory management — it's a complete microprocessor. I came back to DEC partly to get the company involved in semiconductors. That was in 1972, and it took 13 years, but we succeeded.

Here's how: DEC produced what I call the first real computer before a semiconductor company produced a real computer by putting the VAX on a chip. I say the VAX is a real computer!

My criteria are the following: Does it have floating-point? Does it have a paging and memory management unit? And is the machine capable of being used to help design itself?

Now instead of being in competition with it, let's say I'm encouraging the semiconductor industry to build better microprocessors, because Encore is predicated on using lots of microprocessors to gain power. Our whole architecture rests on parallelism using a number of processors — a new computer structure called a "multi," for multiple microprocessor.

Our success depends in part on getting good components, so it's to my advantage to encourage the semiconductor guys to come through with good microprocessors. And that's beginning to happen.

Despite Gordon Bell's official retirement from The Computer Museum board of directors, his interest in and proprietary sentiment for the museum remains lively. Even his necktie is imprinted with the museum's logo.

By 1990, my own personal goal for The Computer Museum is to collect every major artifact. We would need a bigger building, with enough space for storage and archiving. What I'd really like is to merge with the American Museum of Natural History and throw all the dinosaurs out. But I don't think it'll happen . . . it's not natural history!

Right now the goal is to increase people's understanding of the present and future, instead of focusing on history. The museum shows the incredible versatility of the computer. History by itself is too dry.

How do you measure a museum's success? You measure attendance and the attendants' response. But my own measure is the collection of artifacts, including the archiving of works and lectures by the pioneers.

One hundred or 200 years from now, I want people to come and say, "Gosh, I'm glad they saved all that stuff." By then they'll understand that informatinn processing is one of the fundamentals of society.

DEC's PDP-8, the world's first minicomputer.

Encore's "multi" challenges VAX's price/performance

C. Gordon Bell helped found Encore Computer Corp. in July 1983 with the purpose of creating a new type of computer: the "multi." Two years into the project, he describes how the new product will fit into the ever-changing marketplace for powerful computer systems.

> *The multi provides substantially more computing power than any other machine in its price range. The architecture uses a common bus with several microprocessors. It's a very simple machine, built almost like a DEC PDP-11 with Unibus.*

At Encore, we're predicated on making computers out of the current microprocessor technology. We will use microprocessors as the base-level component to build bigger systems. We call our computer the "multi," and I claim it's a new machine class.

If you look at computers in terms of technology generations (see chart below), integrated circuits caused the birth of minis; microprocessors and memories led to personal computers and workstations. Ultimately, they will also lead to multis. If I'm right, in five years everyone will build that way.

Over the last few years, a line of [transistor-transistor logic]-based machines has come out that show a 15% per year compound performance increase. [Emitter-coupled logic (ECL)]-based machines' performance is roughly two to three times higher than that. Of course, you can make bigger ECL machines, like Cray supercomputers and so on, but I'm speaking of maximum minicomputer or mainframe product lines.

The Microvax II has roughly the same performance as the VAX-11/780, on a MOS and Cmos technology line. These MOS-based machines show about a 40% to 50% per year increase in performance.

But performance scales don't show the other dimension: cost. The Microvax II contains two chips, whereas the 11/780s might use 20 boards to achieve equal performance levels. So the Microvax obviously has higher performance per dollar by probably two orders of magnitude. The multi will do even better.

Machine classes come out of price ranges. The mini is what happens when you operate a machine yourself for a group. A mainframe is something that you get somebody else to operate, so it's a service. A supercomputer is often a regional machine, so it's a resource that either a few people have or that you operate for a region.

Mainframe costs cover a range from several million dollars down to $400,000. The mainframes' gradual price increase just reflects inflation. Prices haven't gone up, and there's no real push for them to go down. Companies aren't looking for lower prices when they buy new computers because they're already committed to a certain price range. They're looking for more performance.

The minicomputer came in at the $10,000 level in the 1970s. There were 100 mini companies in that period, of which seven survived. Then the personal computers and workstations were introduced at even lower costs, based on microprocessors. I'm predicting the multi will be a mini-class machine.

The multi provides substantially more computing power than any other machine in its price range. The architecture of the multi uses a common bus with several microprocessors, which connect with memory. I/O runs off the same bus.

It's a very simple machine, built almost like a DEC PDP-11 with Unibus. If you build a computer that way, you can put a great deal of processing power into a very small area and build it much more cheaply than mainframes or minis.

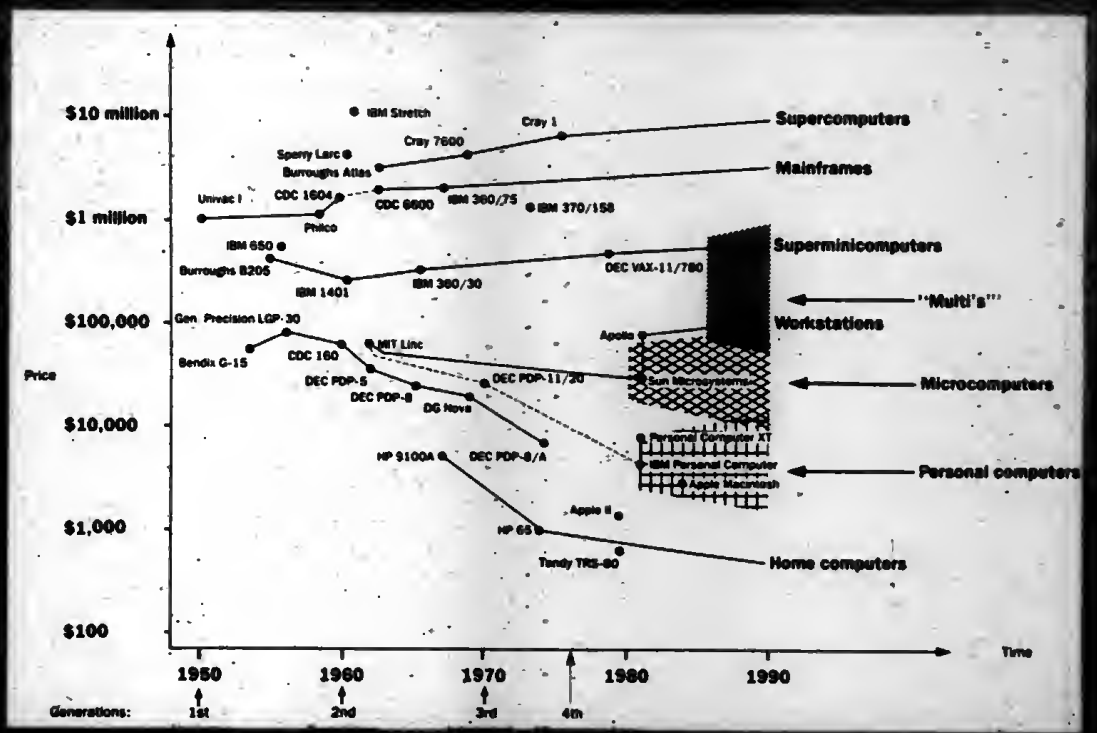
In fact, if you look at the resulting price/performance, Encore has a machine that starts at about $100,000 and goes up to about $400,000. Our first product offering is modular — you can add processors for additional speed and power. Performance goes up to 15 million instructions per second (Mips) in a straight line — sort of 1.5 Mips per card.

Compare that with the VAX family, which goes up to about 5 Mips with the 8600, at many times the cost. I believe we'll be able to deliver more power in one box. Our own bus can sustain operations of 100 Mips.

One factor in our development was that every time you want to create a new computer architecture, you need a new organization. In retrospect, that isn't why I started a new company, but it's turned out to be helpful.

At DEC, I tried to say "we're going to predicate our future on multiprocessors," but I had only a minimal effect, even though I had personally been involved in eight multiprocessor computers over the last 20 years.

The question still ahead of us at Encore is, how do you program them? How will users get the maximum power out of a structure like that?



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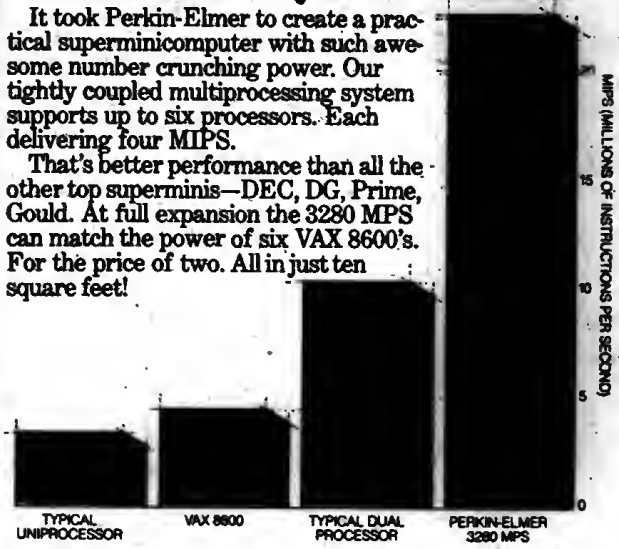

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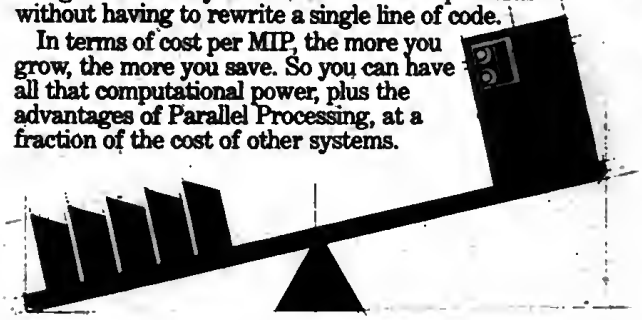

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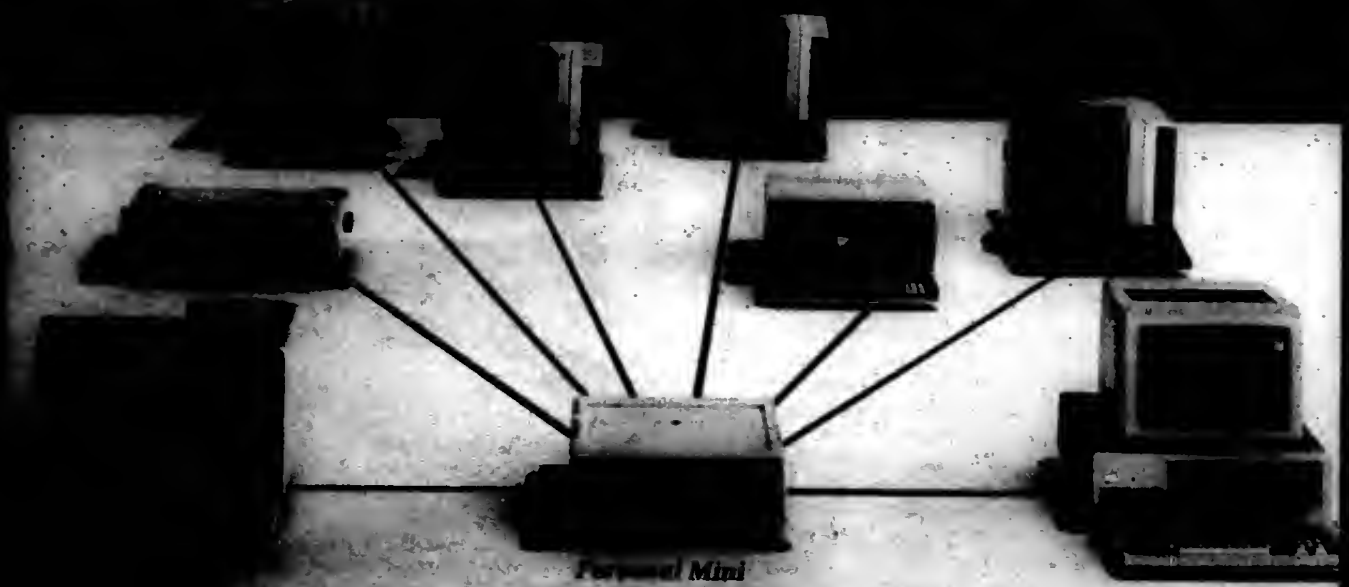

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IN DEPTH

MAKING CHANGE

By Daryl Conner

It's not enough to design a new system or install new machines. DP must create the environment for change that makes the new technologies work.

An abysmal number of new technologies fail to live up to their productivity potential or fail completely simply because users aren't comfortable with change.

The obvious truth is that people are creatures of habit, scared of anything that jars their sense of balance, upsets their sense of control or disturbs their sense of purpose — exactly what new technology often does. As we continue into the information age, the consequences of not adjusting to change are grave.

Corporations studying the impact of new technologies find repeatedly that resistance, sluggish acceptance, "garbage in/garbage out" and outright sabotage cost millions of dollars. This mounting evidence shows that MIS/DP professionals, whether working for software or hardware vendor firms or inside a user company, are increasingly judged on more than an ability to design, build, install or acquire a fast, accurate machine. These professionals must also help motivate others to use the technology to full advantage — a task easier said than done, as I have discovered in more than 10 years of advising Fortune 500 companies, state governments and the U.S. military on implementing organizational change.

Most people don't dislike or resist technology, at least not to the extent portrayed in current literature. What they generally fear are the changes technology imposes on their lives. "What will this do to my job, my security, my authority, my access to information, my relationships, my values, my life?" These concerns often lead to resistance.

Resistance need not be a malignancy. In fact, it can be viewed as an ally — a tool, which in skilled hands can facilitate technological assimilation. Many within the technical community already have become consciously competent in dealing with human responses by learning the dynamics of change, why resistance occurs and how to use it to augment, not hinder, production.

There are, however, still far too many who can only be categorized as unconsciously incompetent. They don't know that techniques exist for easing the transitions people must make when faced with new technology. Because they are prone to implement change in a manner comparable to a bull in a china shop, these people frequently precipitate disaster.

There are those who comprehend the discipline and effort required to help people adjust but who still don't follow through because of a lack of time or money, political support or other resources. These managers know they must make adjustments because they have not appropriately applied the ground rules for managing change.

Finally, there are those who through superior intelligence, luck, cunning or just seat-of-the-pants common sense, are fairly adroit at human relations. Their skills — learned by trial and error — are often unconscious, not a thought-out methodology that can be taught others; so application is frequently inconsistent.

DEC'a atory

Marvin Collins and Kathe Tortorice of Digital Equipment Corp. were in this latter, unconsciously competent category when they approached me two years ago. They exemplify how change management can be implemented inside one of the most successful high-tech companies.

By the time I met Tortorice and Collins, the two had begun to wrestle under control a massive, cross-departmental, multifunctional change. As a team of change-oriented managers for DEC, they had figured out that major change is a sophisticated process, not a simplistic event.

They understood that every change can be designated and understood by three states: the

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present state — the way things are now; the transitional state — a time of ambiguity and stress when people must relinquish old habits but haven't totally grasped new ones; and the desired state — the way we want things to be.

Tortorice and Collins wanted more information on how to plan for and move through these stages in environments where players and variables are numerous and complex.

Pivotal roles

They were, for instance, unfamiliar with the universality of the roles in any major change, even though they had seen them in action in their own company. They came to learn that every change effort involves the following three roles, which at first glance seem simplistic but which are pivotal and often complex in the ways they mesh.

Sponsors possess the organizational power to legitimize change. Even in the most unstructured organizations, major change is impossible without them. Generally, the term applies to upper level managers, who may not understand every detail of what they authorize.

Targets must learn new behaviors, skills or knowledge because of a change. They must accept, adjust to and use the technology.

Agents are go-betweens, assigned by sponsors to implement change.

These roles can and often do overlap. A senior officer, for instance, sometimes plays all three parts when pushing for a decision support system that he must also learn to use.

Role entanglement

The intertwining of roles can run amok. For example, when a sponsor tells MIS/DP personnel to force others in a company to use new equipment, sponsorship responsibilities are being pushed downward.

MIS/DP may grab at this opportunity, thinking it means more power, but a year later everyone may be wondering why the new system has failed. By failure, I don't mean that the system doesn't work. Unless people incorporate computers into their daily routine, all of the grand calibrations of productivity increases go out the window. Sponsorship cannot be delegated.

What is needed is a sponsor who is willing to tell targets, "Watch my lips. We've asked MIS/DP to install the system and teach you how to use it. But make no mistake. MIS/DP is not ordering this change. I am. If you have any problems, come see me."

At other times, the roles of target and agent must be assumed by the same person. The sponsor goes to a MIS/DP manager and says, "I want everyone, including you, to start operating this way."

A breakdown can result because the sponsor has forgotten that the MIS/DP manager is, first and foremost, a target who may resist the change. Until that manager supports the new way of doing things, he will have a hard time selling others on the idea.

Even the role of sponsor can itself be split in two. The distinction falls between initiating and sustaining sponsorship. Initiating sponsors are high enough in the organization to force a project into motion; they possess the power to legitimize change but don't always have time to ensure the change process is completed successfully — and on schedule.

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Thus, sustaining sponsors are required: managers without the power to initiate change but who are close enough to targets to stay on top of the change project once it begins rolling. They have the logistic, economic and political proximity to maintain the momentum.

The change process is not unlike an ocean liner, which needs far more power in the first lurch away from the dock than in maintaining a speed of 15 knots.

Pyramid effect

Successful change begins by initiating sponsors treating potential sponsors below them as targets. Once these targets become committed to change, they become sponsors who again treat others below them as targets.

The new targets are converted into sponsors also, and so a pyramid of support is built all the way to the assembly area, the section or the branch office — in other words, to the sustaining sponsors at the implementation level.

Without this attention to development of sponsors, many strategic decisions disappear into a black hole somewhere several layers down in an organization, and no one can ever seem to put a finger on exactly what happened.

One other role should be mentioned — the advocate. Advocates want to initiate change but can't show sufficient sponsorship power. I mention the role because some people assume they are sponsors when they are not.

These role definitions were part of what Collins and Tortorice took back to DEC after their initial training.

Commitment in stages

Before any technology is introduced or any other change is initiated, people must come in contact with the idea that something new is percolating, possibly ready to burst on the scene. Preparing people for change does not end here. It is amazing how often people hear about a proposed change (or glance at a memo), and the information goes in one ear and out the other. The idea doesn't stick.

Skilled change agents know that for preparation to be complete, people must be made aware of the proposed change: "Hey, this is serious. Something new is on the way." Only then will people grapple with what the change means to them.

Later on, confusion could be a sign of resistance, a deliberate smoke screen raised to mask noncompliance. Agents or sponsors, however, make serious tactical errors if they don't perceive early confusion for what it is — simple misunderstanding — which is one reason clear and precise communications about new technology are so important.

Assessments

Once people begin to understand the ramifications of a change — why it is being introduced and what will happen because of it — they weigh the pros and cons.

Individual assessments of new technology are always a jumble of positive and negative judgments, amplified or diminished according to fluctuating moods: fear and hope, anxiety and ambition, ego deflation and inflation. These judgments radiate from individual views of reality, scrambled and shifting in every person because of their mix of emotions, philosophy and manner of analytical thought.

The best expediters of technological change are adroit at perceiving these reactions and accentuating the positive. If negative judgments predominate, resistance occurs — either overtly or in the hidden recesses of the mind; either can hamper the installation of new technology.

If positive perceptions dominate, people can decide to support installation. An actual willingness to give time, effort and other resources to installation is a big step, a threshold that, once crossed, is the first real sign of commitment. In fact, there are various stages of commitment.

As everyone involved with technology knows, early commitment is often ephemeral. Just as newlyweds bask in the glow of a honeymoon, employees in the early stages of change exhibit "uninformed optimism."

Only later will they begin to spot the bugs in the process, just as spouses discover each other's flaws. I call this awakening "informed pessimism" — the cracks in the new system become apparent. Let that pessimism mushroom enough, and people will begin to "check out" mentally, either secretly or overtly, and enthusiasm fizzles.

Without expert coaxing, employees will generally not talk to management about their disgruntlement. Such resistance after installation is, of course, more serious — and costly — than that which occurs before.

Resistance as change

Still, the skilled practitioner recognizes that resistance is an inevitable part of the change process. Instead of browbeating resisters into submission, open discussion of resistance is invited, the cause is analyzed and the information used to fine-tune the new system, which can turn pessimists around toward a more realistic, optimistic view.

> *The skilled practitioner recognizes that resistance is an inevitable part of the change process.*

A thorough understanding of resistance leads to informed decisions on whether to continue the implementation. Assessment techniques and other written materials are available for gauging the type and extent of each of the many possible grievances. Some typical reasons for discontent include the following:

- People don't understand the purpose for technology, or they don't think the purpose is valid.
- They've changed their routine, or they are learning additional skills or working harder and longer without adequate incentives.
- Once they felt comfortable and successful but now are struggling to learn new ways, worrying perhaps about losing their job, their autonomy, influence or power.
- Barely able to keep up before installation, they think the new technology requires even more speed from them.
- They don't trust or respect those sponsoring or implementing the change.
- They see the equipment as hazardous or painful.
- They believe efficiency will plummet.

Decisions to maintain the new technology for long enough will eventually make it part of established procedure, sanctioned by the entire culture. When that happens, top management has provided its highest level of commitment. A formal sponsorship is no longer needed because organization expectations and momentum take over; accompanying procedures can't easily be scrubbed.

No longer a deviation, the new norm is bolstered by rewards and punishments designed to perpetuate it. Unfortunately, even at this stage, employees may continue to drag their feet, mimicking suitable behavior while their wills pull in other directions.

"Mach 2" commitment

Targets and agents can reach the highest form of commitment only if their own interests, goals and beliefs are served through optimum functioning of technology.

This "Mach 2" commitment, which I call "internalization," is contagious. It blossoms when employees believe they are doing something worthwhile and have a say in designing new procedures or molding technology to their own specifications. Thus, they have a stake in advocating the technology because they are, in a sense, praising themselves. They don't sit back as easily and say, "I could have told you what was wrong, but nobody asked or bothered to listen."

I don't mean that lower level employees run the show. When that happens, there is revolution and chaos. Creative participation reaches a zenith, however, when targets receive clear, accurate information about a change; are considered to the extent possible in planning and execution; and are rewarded for enthusiastic participation and input.

One further warning: Individuals pass through change stages at different times, intellectually and emotionally, leading to mixed signals, starts and stops. The skilled change agent learns to decipher when emotion and intellect clash.

While the various stages as a rule must be passed through sequentially, a sponsor can skip them by decreeing that the new technology is now part of established procedure, or "institutionalized," and that everyone who doesn't like it can leave.

The dictatorial style meshes nicely with that of many traditional technicians whose attitude was, "If users can't learn to operate the equipment, it's not my fault." Nevertheless, I am the first to say that jamming change down employees' throats and dictating behavior are sometimes appropriate.

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> *Jamming change down employees' throats and dictating behavior are sometimes appropriate. This authoritarian approach, however, always costs in poor morale, firings and divisive management-employee friction.*

The authoritarian approach, however, always costs, often massively, in increased monitoring of employees, poor morale, firings and divisive management-employee friction.

Change at DEC

Collins and Tortorice took this knowledge and information from our initial training and inserted it into their own model for changing whole levels of the bureaucracy in a company where high-powered, fiercely independent and creative people feed off each other at breakneck speed. Irrepressible change is the norm at DEC.

Collins and Tortorice applied their thinking first to an attempt to alter DEC's order administration, the step-by-step process in which an order is taken by a sales representative, scheduled and matched with the manufactured product delivered, along with an invoice to a customer. Previous attempts to tamper with the process had resulted in unexpected confusion. This process cuts across several independent departments that had to be involved in the change to achieve the desired impact.

The team decided the first step was to convince those planning the change to concentrate on the specific work or jobs they thought should be transitional. The team wanted managers to analyze in detail "what work is being done now, what work needs to be done in the future and what transition steps are needed so that work continues in the interim," Tortorice explains.

Regrettably, planning sessions often degenerated into discussions about organization, not work. As Collins put it, "As soon as somebody started to talk about change and everybody prepared to jump on the change boat, anybody who was to be affected by the change would get defensive and want to reorganize to protect their work segment. We had to slice out and separate discussions of what the work is and who performed the work from talk about who managed the work."

Adds Tortorice, "One of the reasons you must have a discussion about what the work is today is that in a company growing 30% a year, most people don't have time to document what today is or was. You are at great risk when you change something but don't know what it is."

Focus on work

By concentrating on work, the two downplayed bickering and confusion and were able to help a diverse group of middle managers define the particular work they were examining as a series of 20 steps. The managers then used Tortorice and Collins to help gather more details about the work by dropping down the organizational ladder to ask questions.

At each level, they quizzed personnel to learn as much about the work as possible. They knew to drop down another notch in the organization when people began answering a question with "I think that's the way it is."

Finally, by questioning employees lower in the organization, Collins and Tortorice found that what middle management perceived as a 20-step

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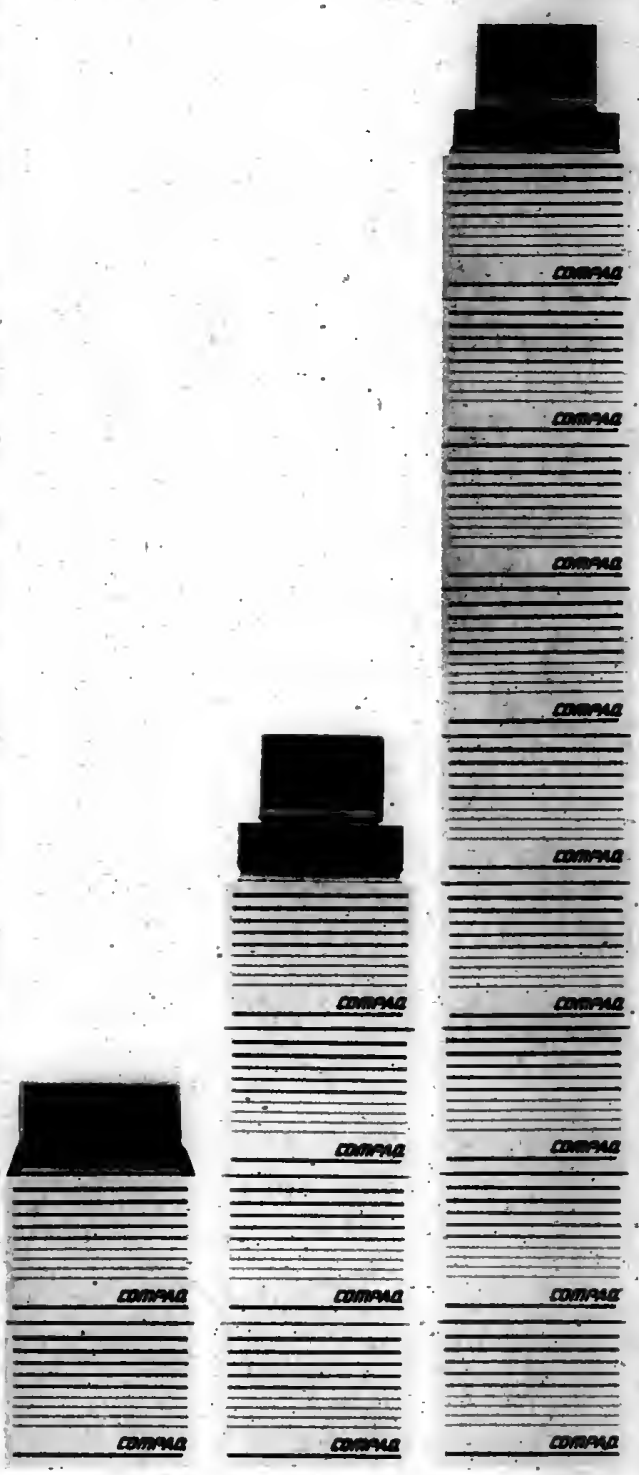

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job really involved almost a hundred steps.

They began "cascading backward" these learned details through the structure, taking them to higher levels of management and making it easier for management to know exactly where change was needed and its potential effects.

Collins cites as example an order for DEC hardware: "The order may have a problem with it because of the technical nature of our products." Employees won't let the order sit idle. They move it off the official flow toward someone who can fix the problem.

"This informal flow is predictable. Every time an order has a similar problem, it will follow the same informal flow until the defect disappears." The order will then return to the formal, planned sequence.

Formal vs. informal

Managerial decisions are often based on the formal sequence, which, Collins and Tortorice note, is just the skeleton of what is actually accomplished. "The insidious thing is that you end up constantly trying to get productivity improvements on the work you can see," Collins says.

"Managers often go after the formal piece, correcting deficiencies there and making it more efficient, when there is this whole chunk down there that isn't being touched," Tortorice says, adding, "That informal procedure is where the major gains are to be made."

Only after managers thoroughly discuss and understand the particular work being done and how it needs to be changed will the conversation shift to organization. Questions that arise include the following: Who are the managers involved today? Who owns the work? Who manages it? Who do you want to own it and manage it in the future? How do you make the transition?

In the next step, systems are explained — whether the work is accomplished through machines or manually. For instance, most companies build work around computer systems. Collins and Tortorice want to do the exact opposite.

"What generally happens is that systems are built, and then the systems begin to define the work," Collins says. "Work, however, is dynamic. The risk of building a system around it is that work is always changing and migrating, making systems quickly unsuitable.

"Inflexible systems lead inevitably to informal work because things can't get done through the systems, through the hierarchal chain of command," he adds.

"The final piece in the model is to identify the means of measuring the particular work," Tortorice says. "Many people change the work but not the measurements; therefore, the behavior stays the same. Changing measurements and integrating them into the work is the lasting way to ensure change stays."

Milestones

At each stage of planning, Collins and Tortorice carefully monitor that milestones are established so that the change can be assessed.

"You develop a picture of today, and then you have milestone one, milestone two, milestone three, milestone *N*, until you eventually get to the new future," Collins explains. This breaks a massive change into manageable chunks so movement can happen over time and be altered as new data is acquired.

If at any point the milestones aren't reached, time schedules and deadlines can be moved back, something that happened several times in the initial DEC project. As in every aspect of their job, when it comes to timing, Tortorice and Collins endeavor to supply management with as many facts as possible.

"We make it a point to get the evidence so that when managers choose to stick with a date for completing the change, they understand the risk involved," Tortorice says.

Using their model, Collins and Tortorice helped bring to successful conclusions this first project and several others since. Their triumphs prompted them to encourage their staff to become certified instructors of change programs. Using these subordinates, Collins and Tortorice now train operations employees to plan and manage major change, a task at DEC normally reserved for staff personnel.

Individual managers assign problems to operations

personnel. They work on the change for a while, developing a sense of the difficulties involved, and then are taught change management skills by Collins, Tortorice or one of their certified subordinates.

Environmental impact

The federal government requires an environmental impact statement before a dam is built. Businesses often throw up a "dam" of change and then see how much damage is done.

In the sessions at DEC, the in-house instructors go over procedures for planning change, such as how to analyze sponsors, agents and targets to determine whether they have skills and desires that will augment or retard the proposed change.

In effect, the trainees learn to draw up an environmental impact for change. Without adequate sponsorship, change agents are faced with choices to either train existing sponsors, find additional or new sponsors or prepare for the technological change to fail.

Also taught are the different forms of communication and how to optimize their use. Some people are unfazed by a so-called "charismatic message" because they respond primarily to cold, hard facts. Others are best motivated by their emotional response to the message giver or because they are thrilled by ultimate organizational purpose. Still others turn a cold shoulder to grand theories, succumbing instead to messages that specify how to get their job done.

Participants in these programs also learn the myriad forms of power and how to use each, the positive and negative attributes of various influence and managerial styles and what works best with different employees. Thus, in becoming change agents, these DEC employees are forced to consider strategies and tactics before any change effort begins.

Participants also come in contact with a spectrum of approaches to resistance and when to use them, as well as how to promote synergism between divergent groups that must work as a team in a change effort.

As change agents, they learn how to modify the frame of reference of those resisting the change. They learn that resistance in most targets stems from different sources than does resistance in managers, who must take into account logistical, economic and political restraints.

Rules don't apply

This approach to managing organizational change is not presented in inflexible rules. Major change inside large corporations is too complex to lend itself to a set of regimented steps adhered to every time.

Rather, managers learn general principles and a matrix of possibilities that fit in different ways, depending on the variables. There is, however, one definite rule: The more a change disrupts an employee's routine and the more significant a change is to the company, the more important commitment becomes.

Collins and Tortorice are now in a third stage of training — learning to be internal consultants to anyone at DEC who needs assistance. In this process, they review the latest information on effective leadership — how to elicit the utmost in creativity, enthusiasm and productivity from others.

They delve into the intricate relationship between a company's culture and change projects (how to analyze and document a culture's impact on a change and how to manipulate the

> ***"What generally happens is that systems are built, and then the systems begin to define the work. Work, however, is dynamic. The risk of building a system around it is that work is always changing and migrating, making systems quickly unsuitable."***

culture to support proposed changes). Thus, they gain further insight on how to remold the entire context in which employees view a given situation so that shared meaning and goals can be built.

Meanwhile, they continue to interact with those inside DEC who completed their initial change management training. When these new change agents hit a snag, some problem they don't know how to handle, they forward their questions to Collins and Tortorice.

Likewise, when Tortorice and Collins encounter a new situation, they explore it in periodic brainstorming consultation sessions with me. Doing so keeps all of us on the cutting edge. Whenever I meet with Collins and Tortorice, I learn as much as they do about the evolving science of change management.

> *'In computer installations, you don't sell it and walk away; you have to support it. You've got to maintain a relationship, a rapport and, most important, your reputation.'*

The same thing happens when I meet Wally Gramling, vice-president of information systems for Cotton States Insurance Co. When Cotton States developed sophisticated software that could be sold to other insurance companies, Gramling was also named president of the company's new subsidiary, S.T.A.T.S., inc., formed to handle sales.

Culture shock

In that position, Gramling — who has installed computers in manufacturing, health care, general professional office and now insurance companies — realized that resentment against technology can boomerang against the software and hardware manufacturers when promised productivity gains don't materialize.

As he puts it, "In every case in which I've been involved, and in particular when it was a situation with first-time users or where large groups of people were affected by the technology, there was quite a bit of culture shock.

"You can install the exact same system in two different locations, and one will be totally successful and the other an absolute disaster, depending solely on the people involved, their personalities and whether they accept or reject the new system," Gramling explains. Therefore, he offers to teach change management skills to potential customers to enhance the attractiveness of his products.

After the sale of software, customers who choose to learn those skills can, according to Gramling, "better understand their role in making the computer system work and better equip themselves to deal with the changes that technology will cause. Then you've got a better chance for a successful installation.

"In computer installations, like anything else, you don't sell it and walk away; you have to support it. You've got to maintain a relationship, a rapport and, most important, your reputation."

Change and revolution

Thus, while the speed and complexity of technological change is outpacing the human capacity to adjust — producing intense resistance — there are numerous success stories.

Users are more sophisticated, increasingly demanding that the MIS/DP and vendor communities understand human foibles, complexities and fears. A revolution has commenced.

As with all revolutions, confusion abounds in the early stages, along with mistakes. Our knowledge of the human ingredient is still a fledgling science. Strides — giant ones — are being made. They nurture the hope that people and technology can coexist harmoniously.

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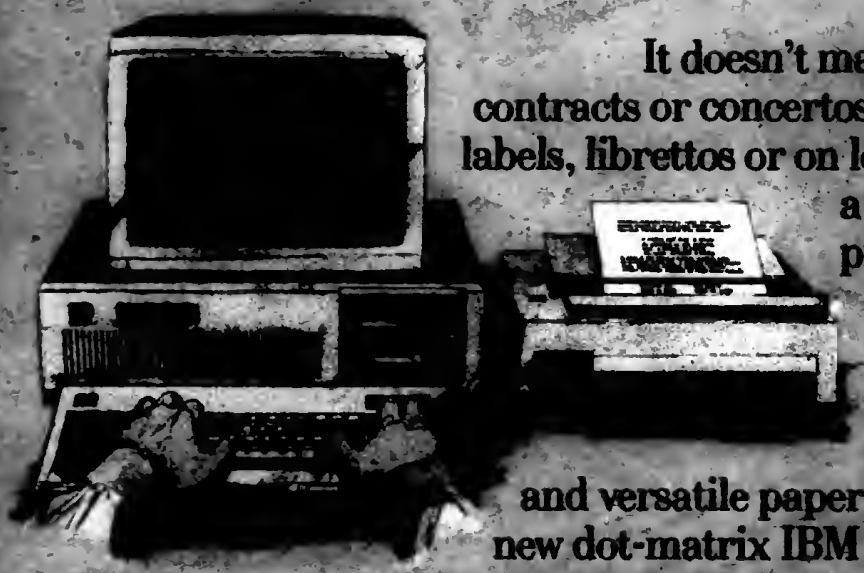

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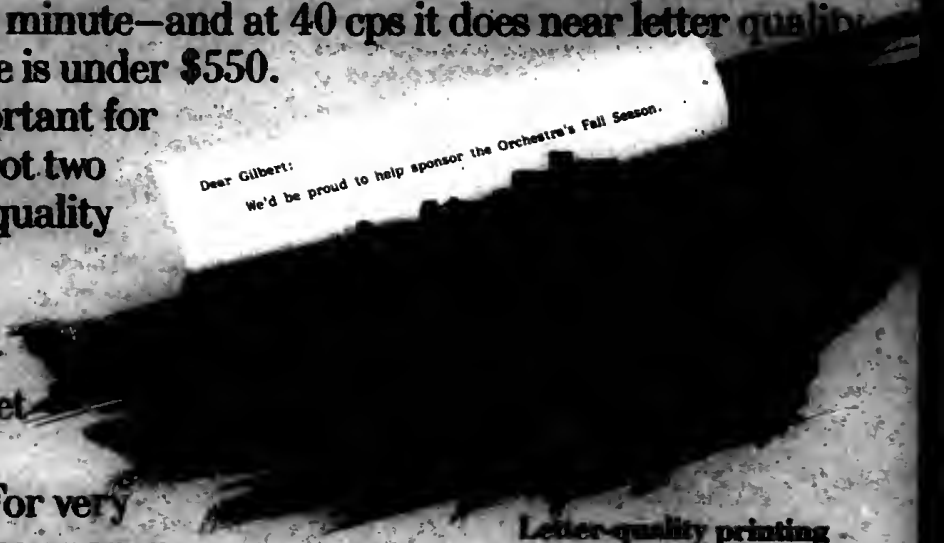

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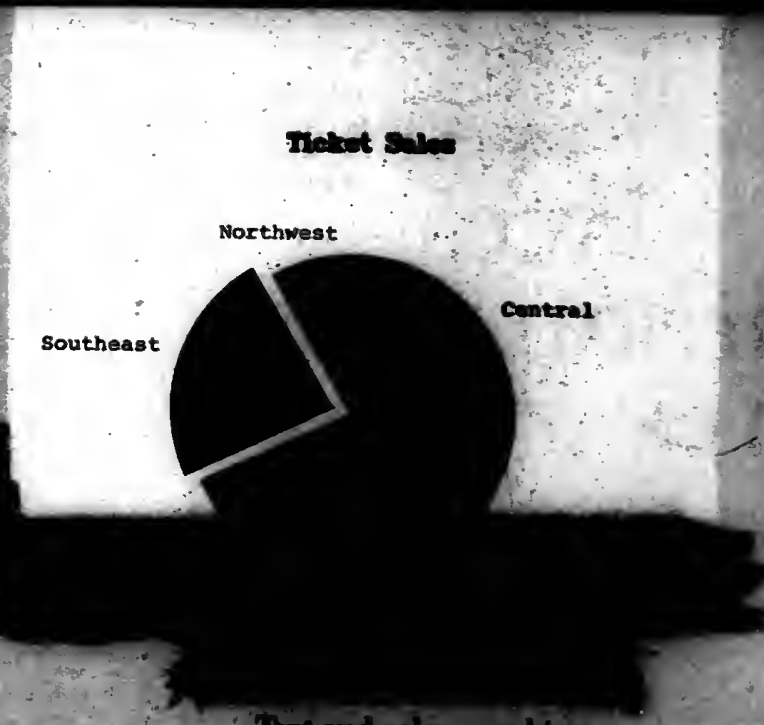

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IN DEPTH

Fourth-generation languages: from backwater to mainstream

By Richard Cobb

The only definition that fits all the products is, "A fourth-generation system is one that improves productivity by providing users with capabilities that are thought by the system's authors to improve productivity."

By all reports, Cobol is still alive and well as the mainstream procedural language for business information processing. An increasing number of Cobol applications are still being developed, but nonprocedural, fourth-generation languages now are being developed and at a much faster rate. In many instances, these languages are supplanting Cobol for new applications development.

Computer languages share one purpose: enabling people to talk to computers. In 30 years, these languages have already passed through three generations into the fourth. We went from machine languages to assembler languages to procedural languages, such as Fortran, Cobol and Basic, to nonprocedural languages — the fourth generation.

One of the most frequently asked questions today is, what is a fourth-generation language? There is, of course, a proper definition. But since all vendors want to say they have a fourth-generation product, the only definition that fits all the products that claim to be fourth-generation is as follows: "A fourth-generation system is one that improves productivity by providing users with capabilities that are brought by the system's authors to improve productivity." This definition, of course, doesn't say much.

PHOTO: PETER MARGONELLI/STOCK BOSTON

True fourth-generation languages, however, share some characteristics. The first is that they are not Cobol; they all make a true break with the prior generation. Also, they are basically nonprocedural, the word that best characterizes this kind of language.

A procedural language is one incorporating the characteristics developed by John von Neumann in Princeton, N.J. Primarily, a procedural language requires its users to perform two major functions: Users must define what they want the computer to do; and they must define the flow of the program.

Nonprocedural languages

In a nonprocedural language, the concept changes. Here, users define only what they would like the computer program to do, while the nonprocedural language processor algorithmically keeps track of the program's flow. This division of labor leads to enormous increases in productivity.

Examination of a flow chart of a computer program will show about 20% of the boxes defining what the program should do. The remaining 80% defines how to keep track of the flow of the program. It is here the productivity of fourth-generation languages is reflected. By eliminating that 80% of the work, we should see at least a 5:1 productivity advantage in program development from that one point alone.

Another characteristic of nonprocedural languages is that they are user-friendly, a key concept, but one that is overused. User-friendliness

Richard Cobb is vice-president of Martin Marietta Data Systems in Greenbelt, Md., and general manager of Martin Marietta's Information Technology Division. Formerly president of Mathematica Products Group, Inc., Cobb was the principal architect of the fourth-generation language Ramis.

means the user finds it easy to be effective when communicating with the computer. It should be stressed, however, that user-friendliness is what the user finds to be easy and effective, not what the author of the computer program says is user-friendly.

Integration

The next common characteristic is a data base foundation that integrates the nonprocedural language. The data base manager should be completely invisible to the user, allowing the user to be free of the details of getting to and from the data base. But a data base foundation must, in fact, be there.

Additionally, the data base needs to have many common functions, all of which are integrated. These common functions include report preparation, spreadsheet analysis, data entry, micro-mainframe communications, command languages and editors. All of these are menu driven and feature extensive Help facilities.

Until these integrated systems came along, organizations had to purchase a variety of software packages to maintain a range of functions. With the advent of true fourth-generation systems, however, all the functions are integrated.

> *Although there is still resistance to change, it is important for organizations to cope with change because success is achieved through change. Only organizations that respond to change will win. Change is the key to growth.*

The history

Between 1967 and 1975, fourth-generation languages were embryonic. During that period, there were pioneer developers and pioneer users. We then moved into what might be called a missionary phase. Then, from 1976 until approximately 1982, an active outreach began.

About 1983, fourth-generation systems began to enter the mainstream of data processing. Fourth-generation languages are just now starting up the steep side of the typical S-shaped curve of growth and product acceptance. They've been moving along the low curve for a long period of time; by 1989 we should see significant penetration of fourth-generation languages.

How are fourth-generation languages used? If they are entering the mainstream, they require a mainstream distribution. In one study of 800 Martin Marietta Data Systems' Ramis II users, the following breakdown was discovered:

- Ad hoc inquiry 68%
- Applications development by computer professionals 67%
- Applications development by end users 53%
- Information center use 46%
- Decision support 37%
- Application prototyping 29%
- Other uses 3%

Because these percentages indicate what both individuals and organizations were doing, they add up to more than 100%. The survey shows different kinds of people doing different types of processing, a very mainstream distribution of DP today.

What kinds of applications were these people developing?

- Accounting 22%
- Financial planning 9%
- Personnel/human resource management 13%
- Materials management 7%
- Marketing/sales 16%
- DP management 13%
- Administrative functions 5%
- Other types 15%

Clearly, the industry has seen a tremendous amount of change as fourth-generation languages have moved from embryonic to mainstream distribution. Although there is still resistance to change, it is important for organizations to cope with change because success is achieved through change. Only organizations that respond to change will win. Change is the key to growth.

In much the same way that fourth-generation languages have evolved and are entering the mainstream, we can see on the horizon that these languages are going to be replaced by fifth-generation systems. A natural question, therefore, is, should I wait?

The answer is no. Most people seem to be getting a 12-month or less payback period from implementing a fourth-generation system. And replacement of fourth-generation languages is not going to take place in the very near future.

It's important, though, that organizations see the trend and be ready for that change, because it is going to come relatively quickly. Even a decade is a very short period of time.

Trends in development

Several trends will affect fourth-generation language development over the next three to five years, as we move from this generation through the mainstream and on to something else.

The first trend is a broadening functionality and tighter integration within computer software. The authors of the leading fourth-generation languages are putting increased effort into adding functionality and increasing integration of their products in an evolutionary way. The results are gains in productivity.

These authors are building on a firm foundation of data base management. They are adding consumer computing tools and applications development tools, which encourage intellectual ferment in companies.

On top of this foundation sit applications. An application has different characteristics, depending on whether it is to run in a batch, on-line, interactive, distributed or workstation environment. The trend is toward the expansion and integration of all these pieces.

Look at the new facilities becoming available for applications development. We are moving from third-generation languages, such as Cobol, to systems that manage transactions.

In any organization, some people are responsible for entering data into the computers. Data entry is commonly accomplished through CICS applications, using command-level languages that are designed to build applications — for example, Adds Online (from Cullinet Software, Inc.) or UFO (from Martin Marietta Data Systems).

Other facilities improving the development of applications include screen definition and management capabilities, report generators that help ferret information out of data and data analysis tools, such as spreadsheets or statistical software, that manipulate data.

The foundation facilities on which these applications development facilities depend include dialogue managers — the interactive management tools that aid users' interfacing with the system — and smart editors that have built-in intelligence.

Other foundation facilities include workstation gateways that are able to service the need for micro-mainframe links, including transfer of data; data dictionaries, both active and passive, which will help to manage the information resource; and external file gateways, which enable us to cope without having localized data extracts by permitting access to the operational data.

A few vendors of fourth-generation systems clearly know where they want to go and are working toward it. Even though the descriptions might be different, there is a common direction. The evolutionary development process is going to create increasingly better systems.

One thing unique about software is that once a product is bought, vendors continue to enhance it. It is not as though you bought a piece of equipment and had to throw it away when you wanted a new one. This evolutionary development process is very important.

Improving productivity

The second trend is the continuing shift of effort from people to computers. People want to increase their personal productivity, and great progress is being made in response to this need. Touching upon some data from the survey mentioned earlier: Of the company sites responding, 15% had only end users using these systems; 14% of the sites had only computer specialists; but 71% had both. Some systems seem to be developed primarily for the computer specialist, some for the end user.

But what kind of productivity advantages are people getting (Figure 1) For ad hoc inquiries, the survey said that 89% of the people were getting 10:1 productivity advantages or more. Thirty percent claimed 50:1 productivity advantages. Those are enormous numbers.

For report preparation, 83% said they were getting 10:1 productivity or more. Remember, 5:1 is the theoretical minimum achieved. Fifteen percent claimed that they were getting 50:1 or more because of all of the other components that are in the system along with the nonprocedural languages.

Figure 1

Even for data maintenance, 62% said they were getting more than a 10:1 productivity advantage, and that seems to be most difficult to do. Eight percent stated that they were getting a 50:1 advantage. For building complete applications, 62%

> ***In the first stage of person-machine interaction, the motto was, "Let the worker fit the tool"; in the second stage, "Make the tool fit the worker." . . . The stage that is just now evolving is a very important one in which the worker will choose the best tool.***

claimed they were getting more than a 10:1 productivity advantage. Nine percent even said they had gotten a 50:1 advantage.

Freedom of choice

A third trend is the increasing distinction between specification and fulfillment. in the first stage of person-machine interaction, the motto was, "Let the worker fit the tool." in the second stage of ergonomics, we said, "Make the tool fit the worker." The difficulty with this approach is that there are 50 million different office workers and 625,000 computer specialists in the U.S.

The stage that is just now evolving is a very important one in which the worker will choose the best tool. More than one tool will be integrated into the same system, and the person can choose what is best for the particular job at that particular time.

"Freedom of choice" is a term that we are going to hear more about in the next few years. Most fourth-generation systems will include the ability to specify more than one way to do the same task so that users can do their own thing in their own way. This is going to lead to enormous increases in personal productivity.

Efficiency

The fourth trend is attention to efficiency. The trend toward increased personal productivity becomes a bottleneck if it is accomplished at the expense of hardware. And fourth-generation languages are becoming quite efficient, to a large extent because their authors are recognizing their importance. For most applications, the languages' efficiency equals or surpasses that of Cobol.

Now how can a language possibly be more efficient than Cobol if the user has to do so much less? Cobol must be more efficient if programmers have to do more.

One reason for this apparent contradiction is a performance orientation. Vendors have been constantly increasing the efficiency of these systems. And the Cobol application program doesn't have the same kind of performance orientation — you're not returning it every year.

The second thing that is very important is that the system — the nonprocedural language processor — has knowledge of what's being done. Therefore, vendors, by building in efficiency, are able to achieve tremendous advantages from knowing what people are trying to do based on how they are doing it. Remember, we control the flow of the application.

One point that should not be overlooked is the pressure on people designing and coding computer programs. Each of the 50 million office workers wants to be more productive, but since there are only 625,000 computer specialists, each one must support 79 office workers. This high ratio puts hinders specialists in doing their best job.

But advances in software architecture and engineering systems are being developed to the point that, if the particular fourth-generation language you are using today is not more efficient than Cobol, it soon will be.

Applications life cycle

Most fourth-generation language productivity advantages so far have been directed at the coding process. The fifth trend is a movement away from this concentration on coding.

The applications development life cycle consists of much more: requirements definition, internal and external specifications, product debugging, unit testing,

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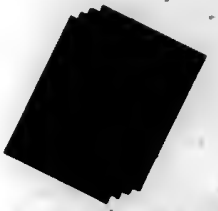

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The Northern Light in Data Communications

systems testing, maintaining the product and getting it into production. Productivity advantages need to include the whole life cycle and not just the coding process.

In order to automate more than just the coding process, computer-aided engineering has given us everything from computer-aided design and manufacturing systems to development and specification systems. We are seeing the development of what might be called knowledge-able editors that know what the user is trying to do. All of this leads to great increases in productivity and enables installations to enforce standards for structured programming.

Communications

A major key to business today is communications. Individuals and organizations that communicate well are more productive. The sixth trend applies the principles of artificial intelligence to improve people-machine communication, using natural languages like English, French and German to talk to the computer.

Several systems are available where people communicate with the computer by typing in English sentences or combinations or fragments of sentences, and the computer responds with the desired information. These technologies, built on the "knowledge-based" concept, are just emerging. These are not toys; they are, in fact, the next communications medium.

The importance of language understanding is clear, and voice recognition is coming along rapidly, assisted by several vendors, such as IBM. We can expect that the surviving form of communication with the computer is going to be largely verbal, and we can expect to see it in the next five to 15 years.

People solve problems by defining a model and then manipulating it, typically using the computer as a calculation aid. The seventh trend, the advent of expert systems, will see this change.

Expert systems

For example, we will see expert systems that can specify a data base. Today, people specify a data base largely by doing the kinds of things that are coming out of the expert systems field. Computers will do a very good job of defining data base structure, calculating the right combination of efficiency and implementation

> *Advances in software and systems are at the point where, if a particular fourth-generation language is not more efficient than Cobol, it soon will be.*

time and all of the different parameters.

Using an encyclopedia (expert systems all are built around a knowledge base or an encyclopedia that they use to reference their data), automatic application generation will replace even the simplicity of a fourth-generation language.

Whether the needed model is an accounts payable processor, an accounts receivable processor or an inventory control processor, we will generate the specifications and code automatically, again by making reference to the encyclopedia. These things are not yet commercially available, but great developments are being made in the field of knowledge-based systems.

Knowledge-based systems will also improve the way one updates an expert system. One of the problems with expert systems is that as soon as you finish debriefing your expert and that knowledge is embodied in your computer, that expert system becomes static — the expert continues to go on and learn, but the system doesn't keep up.

The way to avoid this situation is to continue to do

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specifications in a natural way. The process of converting expert systems through Prolog, Lisp or some of the other available methods is expensive — somewhere between half a million and a million dollars to develop a typical system.

The concept of consistency

The concept of being able to make largely correct inferences based upon the data available is the keystone of AI, the "fifth generation." That brings us to the eighth trend — micro-mainframe consistency, micros (intelligent workstations) working together with host computers in an integrated fashion.

Since the advent of hardware, the computer industry has gone through three stages. In the first phase, mainframes operated by themselves, in some cases with IBM 3200 terminals attached. Next, mainframe computers and personal computers worked independently. In this mode, there was a return to the days of keypunch errors, when everybody goes to a meeting and argues about who has the right data or who has the minimum number of keypunch errors in their spreadsheets.

> *"The importance of language understanding is clear. . . . We can expect that the surviving form of communication with the computer is going to be largely verbal, and we can expect to see it in the next five to 15 years."*

The third stage, the one that we're moving into now, integrates intelligent workstations and host computers so that they work together, not independently.

This last stage raises the question of distribution of functions between the mainframe and the workstation. It seems logical that the mainframe would deal with managing the information resources critical to the corporation. Data integrity within the whole system is also very important; someone must control data integrity, and software on the mainframe will need to do it.

What are the workstations going to do? Person-machine interfacing — voice communication and natural-language understanding — is going to be largely delegated to the workstations. This will require a great deal of CPU capability, local analysis capabilities and prototyping. People will develop most of their applications on workstations. Eventually, the applications will run on mainframes and do decision support.

A very important point in this scenario is that the mainframe and workstation must work together as a team. That means they will share a software solution. There will be automatic links for data output and request transfer so that users won't even know when it happens. We will see distributed processing, with appropriate processes, taking place at both locations.

Predictions

These eight trends of the next five to 10 years will continue to drive the development of software products that enable people to increase their own personal productivity.

In retrospect, the evolutionary milestones of major software technology include the following: report writers from 1969 to 1975, data base technology from 1976 to 1984, and fourth-generation language systems beginning in 1982.

As the evolutionary process continues over the next decade, fourth-generation language systems will stay in the mainstream until about 1989. Then in 1991, we will move into the fifth-generation model-driven system, the AI-based system. Moreover, the systems of that generation are not going to be composed only of AI products. They are going to be scattered in an intelligent sort of way through the systems as they begin to take over.

It would appear then, that fifth-generation systems will begin to replace fourth-generation systems in the mainstream within the next decade. Although fourth-generation systems are clearly entering the mainstream now, they will be replaced with the more productive systems of the next rank. That's evolution, that's progress, that's just the change we are experiencing in the information processing industry.

"No — I thought your department was going to develop the software."

MICROCOMPUTERS

SMALL TALK
Eric Bender
CW Senior Editor

Javelin, GNP aim high

Javelin Software Corp.'s formal unveiling of its microcomputer analysis software two weeks ago set some kind of standard for product introductions. Held in Boston's Museum of Science, the rollout topped an hour of hyperbole and self-congratulation by winding up the museum's Van de Graaff generator and zapping lightning bolts, accompanied by the triumphal finale of Mussourgsky's *Pictures at an Exhibition*.

It's not clear how that extravaganza will be topped at Comdex/Fall '85, so I'm taking a helmet and Nomex protective suit to Las Vegas.

But the standard Javelin really wanted to set, of course, is in business analysis software, replacing Lotus Development Corp.'s 1-2-3.

Chairman Robert Firman listed five demands from corporate users: They don't want to believe that analysis begins and ends with sticking numbers into spreadsheet cells, they want to know where the numbers come from, they want to understand the reasoning behind recommendations, they don't want the management team to be separated from the people running the machines and they'd like to reduce the overall time devoted to business analysis.

Answering these demands is a worthy goal, and the package looked well designed in a brief demo by President Stanley Kugell. The audience was impressed with that glimpse, although no one had a chance to play with the software. The program is set to ship this month, so we'll soon find out whether it really pushes the frontiers

Continued on page 80

Cauzin unveils Softstrip

Prints digital data on paper to be read by micros

By Eric Bender

WATERBURY, Conn. — A technology that permits data and programs to be printed on paper and then read by personal computers debuted last week from Cauzin Systems, Inc.

Offering cost and durability advantages over alternative methods of distributing data, the Softstrip system will find widespread use in business, the company claimed.

In Cauzin's Softstrip scheme, ⅝-in.-wide strips of encoded patterns are printed on various types of paper, either through commercial printing processes or by desktop laser or dot matrix printers. Holding up to 5.5K bytes, the strips incorporate sophisticated error-checking techniques and can be linked together for lengthy programs or files.

Softstrip permits hard-copy data to be read by micros.

Softstrips can be read by the Cauzin Reader, a lightweight $200 self-aligning optical scanning device that plugs into an RS-232 port. Versions configured for the IBM Personal Computer and the Apple Computer, Inc. Macintosh and Apple II will be available in January.

"Until now, we've had two rather limited methods for distributing data and programs, through telecommunications or on diskettes," according to Cauzin President Robert Brass.

Softstrips can be created with standard printing processes on ordinary paper, are more sturdy than diskettes and fit more easily into existing ways of distributing printed matter, Brass said.

Several computer periodicals will begin printing Softstrips in issues starting early

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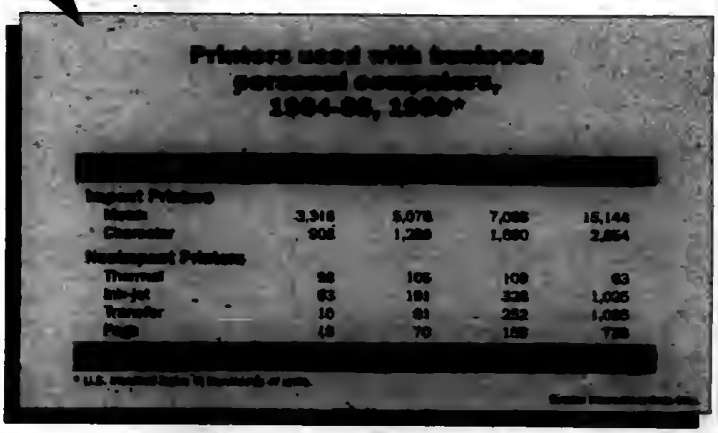
MICROSPOTS



Microsoft introduces enhanced mouse version

Microsoft Corp. of Bellevue, Wash., has introduced a version of its Microsoft Mouse pointing device, said to feature improved ergonomic design, higher resolution and near-silent operation on all surfaces.

Microsoft Mouse Version 5 has been reconfigured with buttons that wrap around the shell so they can be pressed from either top or end of the device, according to the vendor.

Resolution has been improved from 100 point/in. to 200 point/in., decreasing the amount of desk space required and permitting users to operate the device by moving their wrist rather than their entire arm.

Teflon runners and a rubber-coated control ball have replaced the steel ball runners and steel control ball for smoother, near-silent operation on all surfaces, the vendor said. The revamped Mouse also features new cable connectors, with thumbscrews that eliminate the need for a screwdriver during installation.

A new version of Zsoft Corp.'s PC Paintbrush software package, improved setup program, new menu and documentation are bundled in with the mouse as are Piano and the Game of Life, two software familiarization tools, and Microsoft Notepad, a screen-oriented editor for program and text files.

The device requires PC-DOS or MS-DOS 2 or higher. Both serial and bus versions of the Mouse, priced at $195 and $175, respectively, are available now.

Sysgen unwraps hard disk drive/tape subsystems

Sysgen, Inc. of Fremont, Calif., has expanded its line of mass storage products for personal computers with the addition of three hard disk drive/tape subsystems.

All provide automatic data backup, mirror-image or file-by-file backup and verification on the fly. They are slated for delivery next month.

The Sysgen Plus, which combines a 70M-byte hard disk drive with a 60M-byte ¼-in. cartridge tape subsystem, costs $5,995. The disk drive offers 30-msec average access time, and the Plus can be suited for multiuser or network server applications, according to Richard Newsome, Sysgen executive vice-president.

The AT Add-In is an internal disk/tape subsystem for the IBM Personal Computer AT that minimizes cost by using the system's existing hard-disk controller and power supply. The AT Add-In incorporates a 60M-byte tape subsystem with either a 20M-byte, 40M-byte or 70M-byte hard disk drive. Prices are $2,095, $2,795 and $4,995, respectively.

Sysgen's Flat-Pak subsystem sits on top of a Personal Computer or Personal Computer XT, under the monitor, and offers either 10M bytes of disk storage with a 20M-byte cassette tape or a 20M-byte hard disk drive with a 60M-byte cartridge tape. Flat-Pak uses the computer's existing hard-disk controller and power supply. The two versions cost $1,395 and $2,095, respectively.

Forte PJ version supports APL for IBM micro users

Forte Communications has announced several enhancements to Forte PJ, its IBM 3278/79 terminal emulation board for the IBM Personal Computer, Personal Computer XT and Personal Computer AT. The vendor said all the features are available as free upgrades to current Personal Computer users.

The new board, Forte PJ APL, supports IBM's APL programming language by emulating the APL extended character set and the 3278/79 typewriter/APL keyboard.

APL symbols are mapped out on the microcomputer keyboard, which reportedly generates 128 characters with font support. IBM Enhanced Graphics Adapter card support allows high-resolution display of APL applications.

Forte PJ APL is said to provide microcomputer users with the same APL support as VS/APL for MVS users and APL Graphpac for VM users, according to the vendor.

IBM light pen support

The San Jose, Calif.-based vendor has also enhanced Forte PJ with IBM 3278/79 light pen support, compatibility with Topview software and 3278 Model 5 emulation.

Additionally, the board now ships with Forte PJ/File Transfer Support software, compatible with the IBM 3270 Personal Computer file transfer package, that allows microcomputer users to access IBM mainframes equipped with Professional Office System/PC2 running under MVS/TSO, VM/CMS or CICS environments.

The enhanced emulator board costs $1,195.

AT&T division introduces plug-in graphics board

Electronic Photography and Imaging Center of Indianapolis, a division of AT&T Information Systems, has introduced a $695 plug-in graphics board said to allow standard color monitors used with personal computers to display television-quality pictures.

The AT&T Truevision Video Display Adapter with Digital Enhancement (VDA/D) is said to increase color resolution by enabling digital red-green-blue (RGB) monitors to display 256 colors chosen from a palette of more than 32,000.

The VDA/D has eight color maps, each of which can accommodate up to 256 different colors. Four maps can be used at the same time in different areas of the screen, allowing the display of up to 1,008 colors simultaneously.

According to a company spokesman, Truevision VDA/D has a high-spatial resolution mode that enables it to display 80-col. text in 512- by 256-pixel resolution. VDA/D has less than 1% memory contention, so software packages execute without any visible delays.

VDA/D pictures can be transmitted over ordinary phone lines, making electronic mail with electronic photographs, on-line data bases with pictures and still-frame teleconferencing possible, the spokesman said.

VDA/D can reportedly display video pictures digitized by AT&T's Truevision Image Capture board frame grabber as well as images created with graphics software packages for AT&T's Truevision Video Display Adapter, including the Truevision Paint software and the Truevision PC Carousel Presentation software. It is also compatible with Media Cybernetics, Inc.'s Multihalo development tool kit and driver.

The board plugs directly into a single expansion slot of 8-bit bus, MS-DOS-compatible personal computers, and its output can be fed directly to composite video monitors, color televisions equipped with radio frequency modulators, analog RGB monitors as well as digital RGB monitors with National Television Standard Code scan rates.

Tapestry remote link bows

Torus Systems, Inc. of Redwood City, Calif., has announced software that is said to link remote IBM Personal Computers, Personal Computer XTs and ATs to Torus' Tapestry networking program running on the IBM PC Network.

Remote Network Link reportedly allows remote users to access the Tapestry network through an icon-based interface over standard telephone lines. Access is achieved through a Hayes Microcomputer Products, Inc. modem rather than a network adapter card.

Remote Network Link provides all Tapestry features such as electronic mail, telephone management, the icon-based interface, remote printing and file sharing. The remote access is transparent, except that Tapestry operations through the link are slower at 1,200 or 2,400 bit/sec., according to the vendor.

The software requires a micro with a minimum of 256K bytes of memory. The cost of Remote Network Link is $250 per computer.

APL Plus PC version out

STSC, Inc. of Rockville, Md., has announced an enhanced version of its APL Plus PC Application Development System software. Release 5 is said to include a numeric spreadsheet-like editor and full screen management.

Other enhancements include the ability to enter full screen forms faster through multiwindow input, a library of commonly used Assembler utilities and new on-line tutorials for producing bar and pie chart graphics and other applications.

The full screen editor enhancement allows an object to be edited while other output remains on the screen and provides for recovery of accidentally deleted data.

APL Plus features updated documentation.

APL Plus PC runs on PC-DOS or Microsoft Corp. MS-DOS 2 or higher and uses 256K bytes of memory. Version 5 costs $595, and the upgrade cost for Version 4 users is $125.

Microsoft upgrades Fortran compiler, Basic interpreter

Enhanced tools run on Macintosh

Microsoft Corp. in Bellevue, Wash., has announced the release of Version 2.1 of its Fortran compiler and Version 2.1 of its Basic interpreter, both for the Apple Computer, Inc. Macintosh.

The new Fortran compiler is said to be a full implementation of the Ansi Fortran 77 standard.

The added features reportedly include an expanded set of sample programs, language syntax extensions such as structured programming constructs, a completely rewritten linker and optional case sensitivity.

The new Basic interpreter increases performance speed up to six times faster than Version 2, according to the vendor.

Added features reportedly include use of English-like commands, Macintosh-style full screen editing, the ability to access and incorporate Macintosh features such as pull-down menus and interactive buttons and edit fields into programs, the ability to communicate through the clipboard with other applications such as Microsoft Word, Microsoft Multiplane, Apple Macpaint and Apple Macwrite, and a debugging capability.

Minimum system requirements for both the Fortran Compiler Version 2.1 and the Basic Interpreter Version 2.1 are 128K bytes of internal memory and one disk drive.

Fortran Compiler Version 2.1 costs $295. Basic Interpreter Version 2.1 costs $150. Owners of Version 2 of the Basic Interpreter can purchase the upgrade for $20. Owners of earlier versions can purchase the upgrade for $75.

Security system out

Winterhalter, Inc. of Ann Arbor, Mich., has announced a security system designed to protect data on both hard- and floppy-disk-based IBM Personal Computers.

Secure, priced at $495, is said to use the U.S. government-approved Data Encryption Standard algorithm to scramble information into an unreadable and undecipherable code.

The Secure system is menu driven and enables the user to encrypt individual files, complete directories or the entire disk.

Secure is compatible with the IBM Personal Computer, Personal Computer XT, Personal Computer AT and compatibles. The Data Encryption Standard encryption processor on the circuit board uses direct memory access interface to the Personal Computer, encrypting and decrypting at a rate of 150.5K byte/sec.

System mart goes on-line

The Boston Computer Exchange has created a computer marketing channel by placing its complete data base of used and new computers and peripherals on-line on the Delphi Communications Corp. Delphi network.

For $6 per hour, or $16 per hour during business hours, computer buyers and sellers nationwide can browse through the listings and make electronic bids. Listings are updated hourly and include prices. The on-line marketing channel is also accessible from 25 countries.

The Boston Computer Exchange, which claims to be the oldest computer brokerage, lists more than 100 brands of used and new computers, ranging from the Osborne Computer Corp. Osborne 1 to IBM CPUs, as well as peripherals and software.

Micropro OKs sites

Another major microcomputer software manufacturer has stepped forward with a site licensing program. Micropro International Corp. of San Rafael, Calif., is making its Wordstar 2000, Wordstar and Chartstar packages available under the program. In addition to site licenses, Micropro will offer volume purchase discounts and optional technical support.

A site license, available for a minimum purchase of 100 units, enables a purchaser to reproduce and distribute programs within a company. Site license prices for Wordstar 2000, which is available with or without documentation, range from $135 to $225.

Volume purchases offer discounts to users who buy 25 or more copies. Prices for Wordstar 2000 range from $213 to $272.

Micropro stated that corporations' current purchases will be credited toward the licenses. Also, documentation may be reproduced by a user. The site licenses and volume purchase are available for three-year periods.

The company is also offering technical support to corporations. For a fee of $1,000 per year, companies receive a toll-free number that will connect them to the software company's technical support staff.

Microsoft meets date

Microsoft Corp. began shipping its Excel package for the Apple Computer, Inc. Macintosh Sept. 30, meeting the delivery schedule announced when the package was introduced in May.

The $395 package from the Bellevue, Wash., firm integrates spreadsheet, data base management and business graphics.

The spreadsheet combines macrocomputers that automatically record user actions, interactive worksheet linking and two-way file transfer with Lotus Development Corp.'s 1-2-3 package. Excel runs faster than any spreadsheet currently available on the IBM Personal Computer, according to Microsoft.

Excel requires 512K bytes of internal memory and an external disk drive, according to the vendor.

Current owners of Microsoft Multiplan for the Macintosh can buy Excel for $200 until Dec. 31.

Software directory unveiled for engineering applications

Management Roundtable, Inc. of Chestnut Hill, Mass., has published a guide to personal computer computer-aided design and manufacturing packages.

"The PC Software and Systems Directory for Computer-Aided Engineering" details what software packages are available and on which personal computers.

It provides listings of suppliers, applications, compatible hardware and prices. Listings are cross-referenced according to applications and systems.

The 82-page directory costs $79.

IBM upgrades emulation control program for AT

IBM Information Systems Group has upgraded its Personal Computer 3278/3279 emulation control program to add support for the Personal Computer AT.

Version 2 of the software, priced at $235, includes a new diskette and published material for the Personal Computer AT, according to the vendor.

A keyboard aid card for that machine also is provided, a company representative said.

The Personal Computer 3278/79 Emulation Adapter card, which costs $905, is unchanged.

SOFTWARE

■ Improved System Technologies, a division of McDonnell Douglas Professional Services Co., has announced Version 2 of its DFDdraw personal computer-based graphics software.

Version 2, which requires a minimum of 640K bytes of memory, has expanded the list of DFDdraw-supported hardware to include the IBM Color Graphics Adapter and monitor, the IBM Enhanced Graphics Adapter with enhanced display, the IBM Enhanced Graphics Adapter with color and monochrome display, the IBM 3270 Personal Computer with color and monochrome display, the IBM 3270-PC with 5272 monitor and APA graphics adapter, the Hercules Computer Technology Co. Graphics Card with monochrome monitor and the Tecmar, Inc. Graphics Master with monochrome and color monitors.

Additional printers and plotters now supported include the Hewlett-Packard Co. 7220 Plotter and the Toshiba Corp. P351, P1350 and P1351 printers. Mouse capabilities have also been added to include the Mouse Systems Corp. Personal Computer Mouse and the Microsoft Corp. Mouse.

It also includes an off-page connector symbol and the ability for data flow diagram bend points to move in relation to moved elements.

The product costs $500.

McDonnel Douglas, P.O. Box 516, St. Louis, Mo., 63166.

■ Assimilation, Inc. has announced a software utility that allows Apple Computer, Inc. Macintosh computer users to print one file while working on another.

Work N' Print is said to make the print files created by the Macintosh visible, saving them for later printing, at the same time as it controls the printer driver. This enables users to continue to work while the Macintosh is printing.

Work N' Print costs $29.

Assimilation, 485 Alberto Way, Los Gatos, Calif., 95030.

■ Greenleaf Software, Inc. has enhanced its set of C libraries, known as the Greenleaf Functions, for eight compilers that run on IBM Personal Computers and compatible computers.

Version 3 upgrades are available for Lattice, Inc.; Microsoft Corp. (including Version 3); Computer Innovation, Inc.; Mark Williams Co.; and Aztec, Inc. C compilers, among others.

Enhancements include the ability to adapt function names to compiler options by truncating or leaving them at full length; the ability to optimize granularity by using assembler code and breaking modules into minimum size functional groups; and the ability to alternate C source files for all functions written in assembly language.

The Greenleaf Functions cost $185.

Greenleaf Software, Suite 101, 1411 LeMay Drive, Carrollton, Texas 75007.

■ Softsell Specialized Computer Systems, Inc. has unwrapped an APL emulator that reportedly converts IBM Personal Computer, Personal Computer XT, AT or compatible computers into full-function APL terminals.

Called APLterm, the emulator provides all APL characters, including overstrikes, with 10 predefined function keys plus 30 function and eight cursor keys that are user programmable.

A communications protocol allows the personal computer to communicate with up to three host computers varying in bit/sec. speeds. Other features include ability to upload and download, screen transmissions capability, plus a status line that can display the current communications configuration, cursor position and mode (ASCII or APL). APLterm costs $195.

Softsell Specialized Computer Systems, Suite 204, 1899 Orchard Lake Road, Pontiac, Mich. 48053.

■ Airus Corp. unveiled a word processor for IBM Personal Computers that is said to use artificial intelligence technology to check spelling in real-time.

AI:Typist scans the dictionary between each keystroke to find matches and highlights mismatches on the screen, the vendor said.

The dictionary is report-

Continued on page 80

TELECOMMUNICATIONS AND

ONCE UPON A TIME THERE WAS AN EGG THAT STOOD ON ITS END.

The scene: a royal banquet with tables of food, goblets of wine and a basket of eggs.

The time and place: Barcelona, Spain, in the year 1493.

The main characters: Christopher Columbus, one of history's boldest and most innovative thinkers, who has just returned from the New World to cheering crowds and jealous enemies. And Juan Fonseca, a Spanish noble with bushy brows and a perpetual scowl.

The story: as the guest of honor, Columbus is enjoying himself immensely. Until Fonseca, his voice reeking of envy, pounds the table with his fist.

"Señor Columbus," says Fonseca, "In Spain we have no lack of clever navigators. If you had not made this great discovery, one of our own countrymen would have done so."

A deathly silence descended upon the banquet as hundreds of ears awaited Columbus' reply. But instead, Columbus took an egg from the basket and placed it before Fonseca and his followers.

"Gentlemen," he said, "as the first to discover the Indies, I challenge you to make this egg stand on its end—without any support whatsoever."

The Spanish nobles tried. They tried and they sweated and they cursed in four different languages—but they could not succeed.

Now it was Columbus' turn.

Picking up the egg, he tapped it on the table, crushing a little of one end—and made the egg stand up on his first try.

"But that's unfair," cried the nobles. "That's easy. Anyone can do it that way."

"Yes," replied Columbus, "it's easy—once someone shows you how."

The above playlet was brought to you by BNR (Bell-Northern Research) for one purpose only. To dramatize our need, as well as our appreciation, for certain types of creative thinkers. Ones like Columbus, who chart their own course and champion their own cause. And ones, like our own engineers and scientists, who have made us a world leader in the evolution of telecommunications—and who have helped make our parent company, Northern Telecom, the largest supplier of fully digital communications systems in the world.

BNR has labs throughout the United States—so come join the quest. Write to: BNR; Dept. HRM-5. P.O. Box 13478; Research Triangle Park, NC 27709. And become part of a company that continues to make the competition stand up and take notice.

BNR

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Continued from page 77

edly based on word frequency instead of standard word lists. It includes proper names and can be expanded. Along with spelling control, menu-driven Al:Typist provides on-screen Help and text merging, according to the vendor.

Priced at $99.95, Al:Typist requires 256K bytes of random-access memory. The introductory price until Jan. 1 is $69.95.

Airus, 11830 S.W. Kerr Pkwy., Lake Oswego, Ore. 97034.

SYSTEMS

■ Continental Telecom, Inc.'s Cado Systems Corp. has announced an IBM Personal Computer AT-compatible micro that reportedly supports up to three terminals and one printer.

The Contel Cado Tiger AT/4 is based on the Intel Corp. 80286 microprocessor and Cados, a proprietary multiuser operating system running co-resident with DOS.

The basic system includes 512K bytes of random-access memory, a 20M-byte hard disk and a 1.2M-byte floppy disk drive. The system can support an optional second 20M-byte hard disk and second 1.2M- or 360K-byte floppy or stand-alone 45M- or 60M-byte streaming tape cartridges with integral power supplies.

The base price is $6,165.

Continental Telecom, Cado Systems, P.O. Box 3759, 2055 W. 190th St., Torrance, Calif. 90510.

From page 73

Cauzin's Softstrip prints digital data

next year, and a number of textbook publishers have committed to printing the data strips in upcoming titles. Cauzin also intends to market Stripware, a library of software programs, according to Neil Kleinfeld, Cauzin's vice-president for marketing and sales.

General business applications are likely to emerge somewhat later, Kleinfeld predicted, with the data strips most suitable for applications with up to 60K bytes of data or program code.

In large corporations, a Softstrip setup could aid in transferring data between incompatible machines or in storing lengthy documents, according to Kathleen Lane, software analyst at Dataquest, Inc. in San Jose, Calif.

"Transporting data is much easier than with a floppy disk," she said. "They're not going to melt in your car." Additionally, users might want to store Softstrip data in standard filing cabinets rather than in computer files, she suggested.

The most likely competition for the scheme will come from other optical scanning devices, she suggested. "We're going that way; the keyboard will not be the primary method of entering data."

Cauzin was founded in 1983 by Brass, who previously worked at Xerox Corp. as director of market analysis and of telecommunications strategies, and Jack Goldman, previously Xerox's chief technical officer.

From page 73

Javelin, GNP aim high

of business analysis and decision support.

Regardless, Javelin officials make an interesting argument that spreadsheets in general, and 1-2-3 in particular, have been pushed far beyond their limits as analysis tools. Spreadsheets stand accused of inflexibility, insufficient signals and difficulty of use.

These are serious complaints, with considerable evidence behind them, and Lotus has not bothered to address them seriously in the new release of 1-2-3, which shipped late last month. Most of the upgrade's improvements focus on power-user features. You can build bigger spreadsheets and crunch them faster — which is fine but irrelevant to both new users and most current users.

While many features are hard to assess quickly, ease of use seems both crucial and relatively straightforward. At least in the demo, Javelin can handle commands typed in simple English (within limits). If that works as well as it seemed to, it's a genuine step past 1-2-3 in ease of use.

However, Javelin may be aiming at a moving target. The week of the Museum of Science blowout, a small supplier of 1-2-3 add-on software began demonstrating an impressive-looking natural-language interface for 1-2-3. GNP Development Corp. President Bill Gross maintained that the HAL add-on could greatly simplify work even for existing users.

He gave the example of one veteran user who called GNP's hot line and was flabbergasted to hear that the program can do sorting. Led through the sorting procedures, the user then thanked the support personnel and commented that he would never be able to do that again, according to Gross.

If GNP drops the tentative $295 price — or better yet, makes a deal for Lotus to distribute the software — HAL might spread through corporate America as quickly as *People* magazine gets around a lunchroom.

Or Lotus could do the job itself. That would be an easier transition than asking users to throw out a standard analysis tool. "It's extremely difficult to introduce any new product from a start-up," remarked Egil Juliussen, chairman of Future Computing, Inc. "To replace 1-2-3 or even make a dent, you've got to be two to three times better.

Will users decide that the much-ballyhooed new packages from firms like Javelin and Ansa Corp. are cause to scrap their current software? We're months away frum finding that out, but Javelin seems to have a fighting chance.

COMMUNICATIONS

DATA STREAM
John Dix
CW Senior Editor

Switching light possible

In the last two years fiber-optic communications systems have increased in speed ten- to twentyfold. While still higher rates are probable, we are nearing the theoretical limit of fiber purity, meaning improvements in speed will depend mostly on developments in the electronics used to drive the fibers.

LM Ericsson, the communications equipment giant based in Stockholm, is developing a device that may be used for two fiber applications — as a photonic switch and as a high-speed signal modulator.

Photonic switching is a relatively new concept. It would enable light pulses to be switched from one fiber to another without having to convert light back to electricity.

Imagine a simple three-port switch that can be used to connect incoming line A with either outgoing line B or line C. Currently, if you want to switch a fiber-optic signal from line B to line C, the light pulses must be interpreted, converted into an electrical signal to make the switch, then interpreted and regenerated as new light pulses.

Ericsson has developed a working model that enables this switching to be done without converting the light signal. In rudimentary terms, the switching is achieved by diverting the light signal from oue line to another by changing a field of current between the incoming and outgoing ports. The company demonstrated this capability, which was housed in a switch about as big as a pencil eraser.

Even though light travels somewhat faster than electricity, diverting light to achieve a switch takes longer than

Continued on page 86

Overseas E-mail here

But wait may be long for other direct connections

By Edward Warner

(CWN) — It used to be that users of public electronic mail (E-mail) systems who wanted to send messages to coworkers overseas faced the same problem U.S. telephone users did before the trans-Atlantic cable was installed.

There simply was no direct connection.

In September, though, Western Union Co. established a direct connection between its Easylink E-mail system in the U.S. and Britain's Easylink system, operated by Cable & Wireless' Easylink, Ltd., a Western Union licensee.

While this is the first such connection, analysts expect other electronic mail service providers — such as ITT Dialcom, Inc. and GTE Telenet Communications Corp. — to follow suit. The industry watchers warn, however, that international connections may be long in coming, despite the multitude of firms with foreign offices.

Interest in offering direct international electronic mail connections is weak because the services are languishing domestically, according to Mark Winther, director of new communications services for Link Resources Corp., a New York market research firm.

Additionally, some public electronic mail traffic is already supported by private electronic mail systems such as those based on IBM's Professional Office System or Data General Corp.'s Comprehensive Electronic Office system office automation software packages.

While the public systems are far more plentiful, Winther said subscriptions are lagging because "E-mail is not worth anything by itself. You've got to hook it to some application." The service providers have to "get in bed with their customers, customize their services to certain applications."

The vendors could encourage service use, for example, by integrating a sales report application with a mail service that salesmen overseas could use dai-

Continued on page 86

NEC America modems debut

A 19.2K bit/sec. modem that works with a proprietary modulation technique highlighted a series of modem introductions from NEC America, Inc. in San Jose, Calif.

The DSP 19200 is a four-wire modem intended for use on leased lines with D-1 conditioning. The device supports data transmission rates from 2,400 to 19.2K bit/sec. and uses orthogonally multiplexed quadrature amplitude modulation. The modem features trellis-encoding error correction and includes an eight-channel time division multiplexer and is protocol insensitive.

DSP 19200 sells for $12,900.

The company also announced a network control package designed for small and me-

Continued on page 86

Case unveils multiplexers

Two diagnostic modems and two multiplexers have been introduced by Case Communications, Inc. of Silver Spring, Md.

Case 4096, a 9.6K bit/sec. modem, features a trellis-encoded error-detection scheme. The synchronous modem, designed for point-to-point or multipoint configurations, is compatible with the CCITT V.29 standard and works with quadrature amplitude modulation.

The modem features diagnostic and remote control capabilities through an optional printed-circuit card that works in conjunction with the Case 5000 Network Management System.

Case 4096 sells for $2,995.

Case 4000-DB1 is an automatic dial-back modem that can restore a four-wire

Continued on page 83

- Tandem Computers last week became the industry's first vendor to pass indpendent tests showing it conforms to parts of General Motors' Manufacturing Automation Protocol/82
- Perkin-Elmer announced a front-end processor that works with its Xelos and Series 3200 computer lines/83
- Trax Softworks has announced a device that links IBM host communications controllers to intelligent modems/83
- ITT's long-distance unit has announced a business telephone service designed to enable customers to place calls automatically over its network via the least expensive route/83

INSIDE

Modems with time division multiplexers unwrapped

Anderson Jacobson, Inc. based in San Jose, Calif., has released a Trellis-coded 14.4K bit/sec. modem and a 9.6K bit/sec. synchronous modem, both equipped with time division multiplexers.

The AJ 1411 enables six users to transmit data over a single four-wire leased telephone line. The 14.4K bit/sec. modem may be used in point-to-point or multiport polling applications, the vendor said. When line quality problems arise, the modem has a fallback capability and will transmit at speeds of 9.6K, 7.2K or 4.8K bit/sec.

The product provides six test loops including CCITT V.54 Loops 1, 2, 3 and 4. An integral test-pattern generator and bit error-rate detector permit network performance tests.

The AJ 1411 modem including Trellis coding costs $5,495.

The AJ 9611 supports up to four terminals over a four-wire leased line and operates over unconditioned lines at speeds of 4.8K, 7.2K and 9.6K bit/sec. Switch settings and changes can be downloaded without remote operator intervention.

The 9.6K bit/sec. modem costs $2,245.

Independent proof shows Tandem wares follow MAP

By Jeffry Beeler

CUPERTINO, Calif. — Tandem Computers, Inc. last week became the industry's first vendor to furnish independent proof that its hardware and software conform to key parts of General Motors Corp.'s Manufacturing Automation Protocol (MAP).

In an Oct. 8 announcement, Tandem reported recent independent test results that certify the firm's products as compatible with the Data Link and Transport layers of the Open Systems Interconnect (OSI) model.

The results were provided by the Ann Arbor, Mich.-based Industrial Technology Institute, which evaluates systems for compliance with MAP 2.1, the latest version of the GM protocol.

Both MAP 2.1 and its predecessor, Version 2, use the OSI standard as their architectural model. Developed by the International Standards Organization, the OSI protocol consists of seven levels of networking specifications, the second and fourth of which are the Data Link and Transport layers, respectively.

In the view of Andy McMillan, Industrial Technology Institute's manager of network evaluation and testing, Tandem's compliance with the OSI model's Transport level is especially deserving of recognition.

"The fourth layer is probably the most complex protocol in the entire OSI specification," McMillan said during a telephone interview. "So in conforming to the requirements of the Transport layer, Tandem has taken a big step toward compatibility with the interconnection standard as a whole."

Within about six months, in fact, the manufacturer of on-line transaction processing systems expects to announce compliance with the rest of the OSI model's constituent layers. "We plan to return to [the institute] and test our products for full MAP 2.1 conformance by the end of the first quarter of 1986," according to Jim Faxon, Tandem product manager.

Possible deliveries in 1986

If the tests prove successful, the company will probably be able to begin volume deliveries of its first certified MAP-compatible products during the second half of next year, Faxon predicted.

Tandem is far from being the only systems supplier that has successfully tested its products for compliance to MAP specifications. But the firm is the first vendor that has accomplished the feat at the Industrial Technology Institute, the only MAP-conformance testing center currently recognized by the MAP Users Group, McMillan said.

To date, every other company that has tested its products for MAP compliance has done so as part of preparations for a huge, multivendor networking display that GM is readying for the Nov. 6-7 Autofact show in Detroit. The display is intended to demonstrate the purported ability of MAP 2 to link systems of dissimilar make and enable them to exchange data freely.

To ensure a successful demonstration, all the participating vendors have done their necessary MAP conformance testing under the auspices of GM.

But, according to Faxon, the days of the giant automaker's direct involvement in compliance evaluation are numbered.

"GM has already gone on record as saying that any product it purchases in the future for manufacturing purposes will have to be certified as MAP 2.1-compatible by an independent testing agency [like the Industrial Technology Institute]," Faxon said.

CONTROLLERS

■ **Perkin-Elmer Corp. has announced a front-end processor that works with its Xelos and Series 3200 computer lines.**

The 3200-CP supplies up to four serial synchronous lines operating at speeds up to 19.2K bit/sec. One line can be used for an Ethernet network with transmission speeds of 10M bit/sec. A single connection from a host PE system to the front-end processor transmits data at speeds up to 500K bit/sec.

Each line can be configured to act as a gateway between the PE machine and a computer working with IBM Systems Network Architecture and Binary Synchronous Communications or X.25 protocols. Up to four front-end processors can be connected to host systems.

The 3200-CP hardware configuration consists of a 7-in. chassis, two I/O interfaces, universal clock module and two line communications multiplexers. Hardware costs $13,000. Prices for software that supplies support for 12 protocols range from $1,000 to $5,000.

PE, 2 Cresent Place, Oceanport, N.J. 07757.

■ **Trax Softworks, Inc. has announced a device that links IBM host communication controllers to intelligent modems.**

The Traxlink 1 works with Trax Terminal Simulation Facility software and enables local and remote 3270 series terminals running IBM VM/370 or VM/SP operating systems to emulate ASCII terminals. The terminals could then access dial-up services such as Dow Jones News/Retrieval service.

The Traxlink 1 sits between a host's communications controller and intelligent modems and supports Terminal Simulation Facility outbound calls. The product works with IBM 3705, 3704 and 3725; Memorex Corp. 1270 front-end processors; and other compatible communications controllers.

One Traxlink 1 is required for each line in use. The device features a 1,200 bit/sec. modem, a Zilog, Inc. Z80 2.5-MHz microprocessor, 16K-bit erasable programmable read-only memory and 8K bytes of random-access memory. It is said to flush all data to ensure data integrity, to allow the use of a normal asynchronous line as a Terminal Simulation Facility line and to support these lines individually, instead of allocating them in groups of four.

The processor costs $1,250, which includes one year of maintenance.

Trax Softworks, 10801 National Blvd., Los Angeles, Calif., 90064.

VOICE/DATA COMMUNICATIONS

■ **ITT Communications Services Group has announced a business telephone service designed to enable customers to place calls automatically over its net via the least expensive route.**

ITT Smart-Wats can reportedly be used with any private automatic branch exchange, so there is no need to modify a customer's telephone system. It automatically finds the least expensive way to deliver calls and bills the customer at that rate, regardless of the line that carries the call.

ITT Smart-Wats service billing schedule includes monthly access charges ranging from $75 to $120, depending on the city, and graduated rates by Wats band.

ITT Communications Services Group, 100 Plaza Drive, Secaucus, N.J. 07096.

From page 81

Case unveils multiplexers

point-to-point or multipoint link via public switch network or direct-distance dialing. Restoration of a line can be controlled at the site or by remote terminal.

A stand-alone version of 4000-DB1 costs $960, and a card version costs $900.

The DCK/T1 works with T1 lines that transmit data at speeds of up to 1.544M bit/sec. The product features a drop-and-insert capability that enables linking bundles of information by an intermediate node without demultiplexing and remultiplexing operations.

The product is compatible with AT&T's Accunet network and supplies redundant capability for automatic switchover at every major point of concentration in the line.

Prices range from $15,300 to $22,500 for the product.

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Data Management This ties the whole system together. Our Digital Communications Protocol integrates voice and data transmissions, resulting in more productive use of your equipment and easy future expansion.

Networking Different businesses need different networks. Our Distributed Communications System and Electronic Tandem Network let you link all your locations, either across the street or across the country.

System Management Adaptability is the key here. You'll have a hands-on ability to monitor and change the entire system day by day, to respond to your changing needs.

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To find out more about System 85 and System 75, call your AT&T Information Systems Account Executive or 1-800-247-1212.

AT&T
The right choice.

From page 81

NEC American unveils several modems

dium-size networks. Network Control and Management System runs on NEC's Advanced Personal Computer and can be used to monitor one to 16 lines with transmission speeds ranging from 2,400 to 14.4K bit/sec.

The package monitors line parameters including power levels, signal quality, frequency offset and dropout. It supports functions for analog and digital loop-back testing, multipoint and end-to-end self tests and automatic polling. The network management package sells for $16,000.

The N2420/30 is a full-duplex modem that operates at speeds from 300 to 2,400 bit/sec. over two-wire dial-up networks. The modem has a modular design and is available in card and stand-alone models. Options include a call-back security system that can store up to 96 user codes and passwords; a Hayes Microcomputer Products, Inc. Autodialer; a NEC automatic dialer that stores 12 numbers and logon sequences; a synchronous dialer; and a security option.

Prices for the N2420/30 range from $575 to $999.

NEC's N500A is a digital service/customer service unit, designed for use with digital transmission facilities, that features four-wire and half- or full-duplex operation at speeds from 2,400 to 56K bit/sec. The asynchronous modem, available in either card or stand-alone models, can be used with point-to-point and multipoint networks and supports RS-232 and V.35 interfaces. An LCD monitors the tests. The devices range in price from $795 to $995.

From page 81

Overseas E-mail here; other connections not

ly to report on foreign sales, he said.

Sending an electronic message long distance is faster and more expensive than sending a letter, Winther noted, and yet, like a letter, the sender has no way of knowing immediately if the message has been received.

Despite this, Winther said, "There's going to have to be interconnection" of the public E-mail systems of different nations. That interconnection, he said, will be speeded as electronic mail vendors set up similar systems in other countries. ITT has already sold versions of its Dialcom E-mail system to both Germany and Britain for use in their national telephone systems, Winther said.

E-mail messages from public systems are most often converted to telexes when being sent to public E-mail systems in foreign countries. But at least one vendor, Electronic Mail Corporation of America, is offering what it claims is the capability to translate public E-mail messages from one format to another and then transmit them overseas on its packet-switched network.

With the company's GEM Service, before messages are routed overseas, they are processed at the firm's headquarters in Old Greenwich, Conn., and translated into the electronic mail form of the recipient country. In return for the slight delay in transmission, Electronic Mail Corporation of America makes "everybody compatible with everybody else," said Nina Scozzari, manager of corporate communications.

From page 81

Light switching now a possibility

switching an electrical signal. A photonic switch may not be able to match the speed of an electric switch, but it does supply other benefits. For example, higher speed connections can be maintained by obviating the need to convert light signals back to electricity for switching purposes. Additionally, photonic switching may increase system reliability by doing away with electronic transceiving equipment.

Large photonic switches could be made by applying this technology to fiber junctions in a switch matrix. This would enable any incoming port to be routed to any outgoing port. This same switching technology can also be used to modulate light pulses to build communications systems capable of higher operating speeds than are currently possible.

Light travels at more than 186,000 miles per second — less than a foot in a billionth of a second. Our ability to modulate or encode light signals to carry information is limited by the speed with which we can turn a light source — usually a laser — on and off. Instead of modulating the light source, Ericsson's light switch can be used to modulate the light itself, a technique called external modulation.

By turning a laser on and off we can encode information into a binary signal (light/no light) that can be interpreted by a computer as ones and zeros. Ericsson's switch provides the same effect as turning the light source off and on by diverting the light signal.

Envision the same simple switch example used before. If a constant light source was being pumped into line A, it could be modulated or encoded to go out line B by diverting the light away from that port, perhaps to a dead-end line C. A light signal, for example, could represent a zero, and lack of light (a diverted signal) could represent a one.

After having said these switches were slower than electrical varieties, remember that to improve on today's fiber-modulation techniques, it is only important to improve the speed with which we can turn lasers on and off. Ericsson has demonstrated that it can achieve communications speeds of up to 3G bit/sec. and claimed it is possible to transmit at 6G bit/sec., more than seven times faster than today's best systems.

SYSTEMS & PERIPHERALS

SHOP TALK
Nicholas M. Baran

Micros moving in engineering

The battle between microcomputers and minicomputers has been developing slowly in the engineering industry. Engineers traditionally are conservative and reluctant to change old ways.

As recently as 1982, many engineers were still using keypunch machines to enter their data, even though the next room was filled with interactive terminals. Project management was done by hand or with a pocket calculator. Engineers were skeptical about microcomputers and considered them to be toys for hobbyists. Mainframes such as the Control Data Corp. Cyber 170 and superminis like the Digital Equipment Corp. VAX-11/780 had a lock on the engineering industry.

But in recent months, microcomputers have been making significant inroads into engineering firms. Engineering software, previously limited to more powerful machines, is becoming available on micro and supermicro computers. These smaller machines now can handle some of the problems that always were solved in minis or mainframes. Software such as Lotus Development Corp.'s 1-2-3 and Ashton-Tate's Dbase II are becoming increasingly popular for project management and data tracking tasks.

Engineers traditionally have relied on large mainframe machines for solv-

Continued on page 109

Baran is manager of computer operations for Cigna Corp., a San Francisco engineering consulting firm.

Through the years with DEC

MIT academics launched interactive processing

SEVENTH IN A SERIES

By Donna Raimondi

At a time when computers cost $3 million apiece, three men developed a system that sold for $120,000, giving birth to what would become the second largest computer company in the world.

In 1957, Ken Olsen, his brother Stan Olsen and Harlan Anderson — all working at MIT at the time — started Digital Equipment Corp. in 8,500 sq ft of a rundown former woolen mill in Maynard, Mass. Most computers at the time were large, batch processing machines, but Ken Olsen decided that interactive processing was a better idea for many applications.

> *DEC's philosophy was that computers should not be reserved for the government and large, wealthy corporations.*

"We proposed how to make computers with transistors, and people laughed at us and said we were just academic. Now we laugh at people at MIT and say they are just academic," Ken Olsen said in a recent interview.

DEC was founded on the philosophy that computers should not be reserved for the government and large, wealthy corporations, as they had been until then, but also should be available to smaller organizations.

By 1960, after three years of selling digital logic modules, the company released the PDP-1, a small, interactive computer. Annual sales reached $6.5 million in 1962, giving DEC the lead in the market they helped to create — the minicomputer industry.

Under Ken Olsen's leadership, DEC outgrew its original 8,500 sq ft, then the rest of the 1.6 million sq ft, 23-building mill that it purchased in 1974. The company spread into neighboring towns, other states and foreign countries as its sales multiplied.

MIT's attitudes toward computers strongly influenced the fledgling company. The freedom the university gave to its researchers and students to use its early computer equipment led Ken Olsen to conclude that interactive systems were the way to go. Out of MIT's policy of letting students work unhindered on its systems came computer games and much of what the world knows about interactive computing, he said.

"The third thing that came from MIT was that computing should be fun," Ken Olsen said. This attitude, which DEC adopted, also gave birth to hacking, which, he added, is both good and bad. DEC's success rests in the company's decision 10 years ago to adopt one architecture and one operating system, according to Ken Olsen. All of the DEC product lines — the PDPs, the VAXs, the LSIs — are compatible from their earliest to their latest versions, a DEC spokesman said. Software that ran on a

Continued on page 96

Masscomp announces Motorola 68020-based 5000 line

BOSTON — Claiming to offer higher performance than superminicomputers and minisupercomputers, Masscomp last week introduced its Masscomp 5000 family of computers, systems based on Motorola, Inc.'s 68020 microprocessors and 68881 floating-point processors.

The product line includes the previously available MC500, renamed the MC5500, and four other models supporting from one to 64 users in scientific and technical environments.

In a press conference telecast to about 25 U.S. locations, the Westford, Mass., company's spokesmen compared the Masscomp 5000 family's performance to systems ranging from the size of the Digital Equipment Corp. Microvax II to that of the Cray Research, Inc. Cray-1 supercomputer.

The Masscomp spokesmen characterized the machines as micro supercomputers that enable scientists and engineers to perform continuous calculations on large sets of data in real-time — the type of applications run on supercomputers — in smaller scale systems and at a fraction of the cost of the Cray-1 and the DEC 8600 superminicomputer.

A spokesman said a fundamental characteristic of the Masscomp products is their ability to bring computing to the type of applications used in environments such as those aboard ships and laboratories in the Arctic Ocean.

According to the vendor, the systems feature a triple-bus architecture, including the Intel Corp. Multibus and the Masscomp STD+Bus, Masscomp's Lightning floating-point accelerator and a two-way associative cache that manages memory references in parallel fashion. They run Masscomp's Real-Time Unix, which is said to be compatible with both AT&T Unix System V and the University of California at Berkely 4.2 version of Unix.

Masscomp claimed the products provide up to one million samples per second in data acquisition sampling rates and perform 700,000 to 10 million instructions per second, 625K to 12M Whetstone operations per second and up to 13M floating-point operations per second.

The low-end products are the MC5300 and the MC5400.

The MC5300 supports one to four users, features a 12.5-MHz 68020 CPU and 2M to 4M bytes of memory, according to Masscomp spokesmen. The MC5300's price starts at $16,000.

The MC5400 is said to support one to 12 users, and features a 16.7-MHz 68020 CPU, 8K bytes of direct-mapped virtual address cache and 2M to 10M bytes of physical memory. It is priced starting at $25,900.

The MC5300 will be available in early 1986. The MC5400 is scheduled to be available in 90 days.

The MC5500 is available as a single or dual processor, supporting up to 16 users, and has been available since 1982. It ranges in price from $16,000 to $54,000, according to the vendor.

The MC5600 is available now in single- or dual-processor configurations with up to 16M bytes of main memory, 8K bytes of cache and 4G bytes of virtual address space, Masscomp spokesmen claimed. Typical configurations costs range from $78,400 to $88,750.

The four-processor MC5700 is scheduled to be available in 90 days.

It supports up to 64 users with 8K bytes of cache memory, 32M bytes of main memory, and 4G bytes of virtual address memory. A typical four-processor configuration costs $167,150.

Fairchild unveils CMOS microprocessor

Fairchild Camera and Instrument Corp. of Mountain View, Calif., last week announced its first 32-bit CMOS microprocessor, using the basic elements of a reduced instruction set computer architecture.

Clipper, scheduled for sample-quantity availability in June 1986 and volume delivery in the fourth quarter of 1986, reportedly runs at 33 MHz and uses hard-wired rather than microcoded instructions to achieve peak performance of 33 million instructions per second (MIPS). Fairchild claimed an average performance of 5 MIPS.

The three-chip module was designed as an AT&T Unix-based engine for use in both scientific and professional computing applications. The three chips include a central processor with an on-board floating-point execution unit and two cache and memory management chips, one for instructions and one for data. The cache chips are linked to a CPU via a dual-bus architecture with one 32-bit bus dedicated to instructions and one to data. Another 32-bit multiplexed address and data bus allows the chip set to interface with main memory and with industry-standard peripheral chips.

A Fairchild official said the key to the module's performance is a scoreboard mechanism that simultaneously tracks events in all resources, a feature he said was previously available only in supercomputers like those made by Cray Research, Inc. and Control Data Corp. He also said the microprocessor has a load-store architecture with instruction prefetch overlapped with integer and floating-point execution units.

The major functional blocks of the Clipper's CPU chip are an integer pipe with a three-port 32- by 32-register file, serial 64-bit double-bit shifter and 32-bit arithmetic logic; a 64-bit floating-point unit with its own eight 64-bit registers; prefetch logic to support an 8-byte instruction buffer; and a macro instruction read-only memory used to execute sequences of standard machine instructions. Clipper costs $2,451.

Tool applies AI to finance

Applied Expert Systems of Cambridge, Mass., has introduced a turnkey expert system that applies artificial intelligence to a personal financial planning product.

The company claimed that Planpower can use a knowledge base of financial expertise to reduce the time required for a typical professional planning project from 60 hours to a few hours.

Applied Expert Systems also said it has signed an agreement to allow First Financial Planner Services, Inc., a Travelers Insurance Co. subsidiary, to distribute the system to independent financial planners. The company still will market Planpower to major financial institutions, such as banks, insurance companies and brokerage firms, through its own direct sales force.

Planpower includes a Xerox Corp. 1186 artificial intelligence workstation and a coprocessor that allows the workstation to run software written for the IBM Personal Computer and Personal Computer XT. It also features the company's proprietary expert system software; data base and spreadsheet software, word processing, an English language interface and compatibility with a Hewlett-Packard Co. Laserjet printer, the vendor said.

The Planpower knowledge base is said to consist of the equivalent of 6,000 decision-making rules and more than 125 types of financial products.

Scheduled for shipment in early 1986, the system costs about $50,000.

Turnkey system out

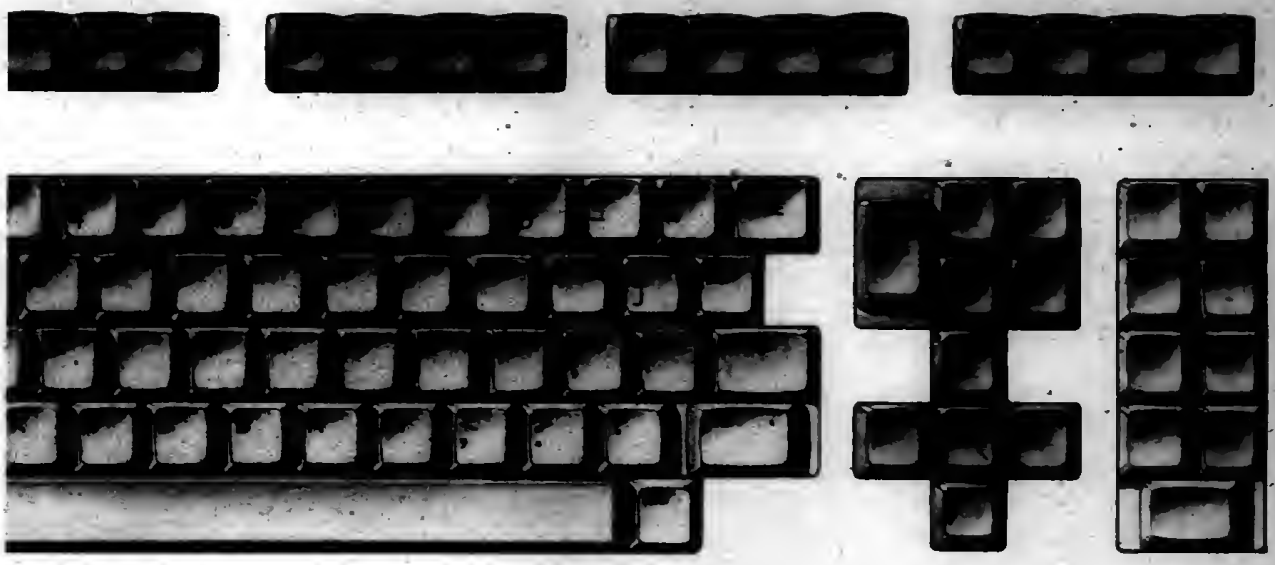
Xerox Computer Services, a Los Angeles-based division of Xerox Corp., has released a turnkey manufacturing management and control system scaled to companies that generate up to $40 million annually in revenue.

The Entry Turnkey system, priced at $236,000, the result of a value-added remarketer agreement with IBM, combines Xerox business and manufacturing software applications with an IBM 4361 Model K3 mainframe running under IBM's SSX and DOS operating systems.

Peripheral equipment includes IBM's 3370 DASD, 8809 magnetic-tape unit, 3262 line printer, 3278 display console and a 3178 user-display terminal. Up to 20 3178 terminals can be added at additional cost.

Modules in Xerox software include management packages for inventory, orders, receivables, sales and procurement, material requirements planning, cost planning and control, accounts payable, general ledger and an interactive query and report generator.

The company reported that the software can be migrated to any IBM 370-compatible system as the user's needs increase.



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Vaxstation II capacity boost tops DEC announcements

A boost in the capacity of its Vaxstation II design and manufacturing workstation headed the list of announcements by Digital Equipment Corp. The Maynard, Mass., company also unveiled a program to allow Vaxstation I users to upgrade to the Vaxstation II and an upgraded version of its MicroVMS Workstation Software.

DEC released a configuration of the Vaxstation II, which incorporates the company's Microvax II computer, that has a larger enclosure with a 12-slot backplane capacity plus provisions for four mass storage units, a spokesman said. The large enclosure configuration allows three RD53 71M-byte hard disks and a tape backup, as opposed to the standard enclosure that allows RD52 31M-byte hard disks.

In addition, the newest version of Vaxstation II includes 3M bytes of main memory, as opposed to 2M bytes in the standard version; 71M bytes of hard-disk space, said to be more than twice the capacity of the standard version; and a ¼-in. tape cartridge. The system features a 5¼-in. floppy disk backup storage device, a three-button mouse, a 19-in. monochrome monitor, a Decnet/Ethernet interface and a graphics subsystem.

The $36,980 price includes DEC's MicroVMS operating system, the newly announced MicroVMS Workstation Software Version 2 and GKS-0B graphics software licenses.

A program scheduled to close on Dec. 31 will enable Vaxstation I owners to replace their systems with a standard Vaxstation II system. The Vaxstation II configuration includes 2M bytes of main memory, a monitor, a keyboard and mouse, a video controller, a Decnet/Ethernet networking interface, RX50 and RD52 31M-byte disk drives and associated software. The exchange costs $16,500.

Software in the exchange includes Version 2 of the MicroVMS Workstation Software. Owners may exchange Microvax I layered-software licenses for Microvax II equivalents at no additional charge, the vendor said.

Version 2 of the MicroVMS Workstation Software package and the graphics interface for the Vaxstation I and II systems are said to provide tools that allow programmers to write application programs in which the user can create, manipulate and draw into windows displayed on the Vaxstation screen. This capability is said to enable users to enlarge or reduce one or more windows.

The programs that can be developed will enable users to emulate different terminals on the screen on a window-by-window basis.

A license for the Version 2 Microvax Workstation Software costs $1,000.

Adage offers workstations

Adage, Inc. of Billerica, Mass., has taken the wraps off four Digital Equipment Corp. Microvax II-based stand-alone workstations — two for DEC environments and two for both DEC and IBM computing environments. All of the workstations operate under DEC's MicroVMS operating system.

Each of the workstations features multiwindowing, multiterminal capabilities that are said to allow users to run concurrently a Tektronix, Inc. 4100 window, four simultaneous DEC VT200 windows and the DEC MicroVMS console window. In addition, the 6580 and 6585 workstations provide an Adage 6080/IBM 5080 window. Four to eight RS-232 ports are available for additional serial devices.

An entry-level workstation consists of Adage's Ocean Graphics Engine; a Microvax II with 3M bytes of memory and hardware floating-point processor; eight RS-232 lines; dual 800K-byte floppy disks; a 105M-byte, 5¼-in. fixed Winchester disk drive; an Ethernet interface; 1M byte of graphics memory; a 19-in. monitor; and keyboard. Software includes a MicroVMS license supporting up to eight users and the Adage graphics library, including Tektronix 4100 and VT200 emulators and the Adage window management system.

The company said the 6580 and 6585 workstations provide IBM 5080 emulation and two- and three-dimensional color graphics capabilities. These models will operate with all IBM 5080-compatible software, such as Cadam, Inc.'s Cadam and IPC and Dassault System's Catia computer-aided design and manufacturing software, as well as with most DEC and third-party software written for MicroVMS.

Prices for the 6580 and 6585 start at $66,500 and $71,500, respectively, and range upward depending upon factors that include the amount of main memory, display list memory and storage capacity.

The DEC-environment-only models provide the same 2-D and 3-D color graphics functionality as the 6580 and 6585. The 6500 and 6505 models cost $49,500 and $54,500, respectively.

IBM plasma-panel display station and coupler out

IBM's Information Systems Group has announced a replacement for its 3290 Model 1 plasma-panel display station and a coupler to pair its 3480 tape subsystems.

The company said the 3290 Information Panels, Models 220 and 230, are functionally equivalent to the 3290 Model 1.

The Model 220 is functionally equivalent to the Model 1 with displays up to 9,920 characters and a data and typewriter keyboard, the vendor said.

The Model 230 reportedly also displays up to 9,920 characters but includes an integrated numeric keypad with the keyboard, similar to the keyboards of the IBM 3179 and 3180 display stations.

Each terminal costs $6,500. In addition, there is a minimum annual maintenance charge of $288, the vendor said.

The Control Unit Coupler 3211 is said to allow customers to couple two 3480 Control Unit Model 22s to form a single magnetic tape subsystem.

It is attached to only one of the coupled control units.

The Control Unit Coupler 3211 is priced at $4,045.

PROCESSORS

■ Perkin-Elmer Corp. has introduced an array processor for its Series 3200 superminicomputers.

The MAP-310 processor was developed by CSP, Inc. of Billerica, Mass., to process 32-bit format floating-point calculations and control I/O in a real-time environment, Perkin-Elmer said.

Software available for the MAP-310 includes CSP's Snap II Executive, a multitasking, real-time operating system for task scheduling, monitoring and control and the Snap II Array Processor-resident library, the vendor said.

The basic MAP-310 system includes 500K bytes of data memory and 128K bytes of memory devoted to the operating system plus an interface to Series 3200 superminicomputers.

The basic MAP-310 costs $44,700. The Snap II software system costs $5,000 for a single-user license.

Perkin-Elmer, Data Systems Group, 2 Crescent Place, Oceanport, N.J. 07757.

DATA STORAGE

■ System Industries, Inc. has unveiled an addition to its 9700 family of disk drives for use with Digital Equipment Corp. VAX and PDP series machines.

The 10¼-in. Winchester-type 9761 disk drive has a transfer rate of 2.5M bytes and a capacity of 689M bytes. It has an 18-msec average positioning time and a dual-channel option. The drive can be used with System Industries' 9900 series of controllers, including the cluster controllers that allow up to eight DEC systems to share a common data base.

The 9761 is said to offer a mean-time-between-failure rate of 20,000 hours. It costs $16,500.

System Industries, 1855 Barber Lane, Milpitas, Calif. 95035.

■ Aviv Corp. has released a tape system and a multiport electronic switch for sharing tape drives among up to six controllers.

The 200 in./sec. group-coded recording (GCR) tape system comes in four configurations and operates in start/stop mode. It can read/write at 1.25M byte/sec. in GCR and phase-encoded densities. The GCR 200 system contains the Fujitsu Ltd. tape drive Model 2436 and Aviv-designed and manufactured controllers.

Configurations for Digital Equipment Corp. VAX, PDP, Microvax and LSI systems cost $38,000. For Multibus systems based on Aviv's Tape File Controller (TFC) 505D controller and for Data General Corp. MV and Nova/Eclipse systems based on Aviv's TFC 715A/B2 controller, the cost is $39,000.

The Multi Port System 300 electronic switch allows the sharing of tape drives with I/O devices that are formatted to be compatible with Pertec Peripherals Corp. devices. Tape drives can be shared among up to six controllers, the company said. The allocation of the tape drives to a particular computer is done via a switch on the front panel for the MPS chassis.

The Model 300-2 two-port switch costs $2,950. A Model 300-4 with four ports costs $4,450; and a six-port version, the 300-6, costs $5,950.

Aviv, 26 Cummings Park, Woburn, Mass. 01801.

■ Thorn EMI Technology, Inc. has announced an embedded interface card option for each of its three ¼-in. streaming tape drives that reportedly makes them compatible with the American National Standards Institute's (ANSI) small computer systems interface.

The company's family of ¼-in. 9-track streaming tape drives includes Models 8900, 9800 and 9900, which are said to be compatible with IBM, ANSI and European Computer Manufacturer Association systems.

The option costs $1,845.

Thorn EMI Technology, 8601 Dunwoody Place, Atlanta, Ga. 30338.

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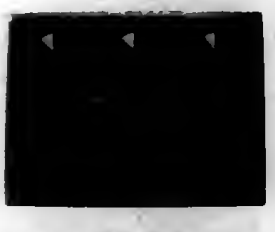

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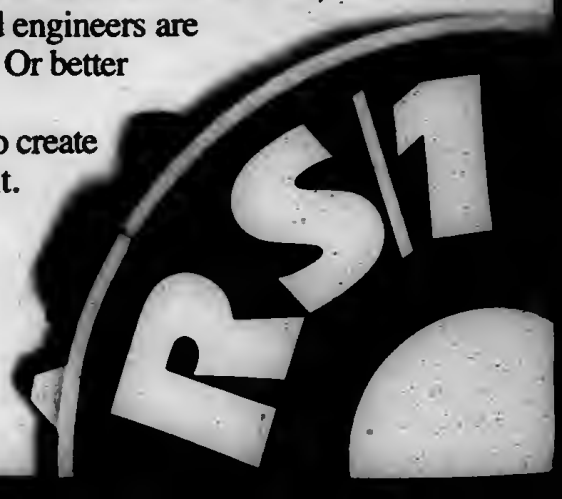

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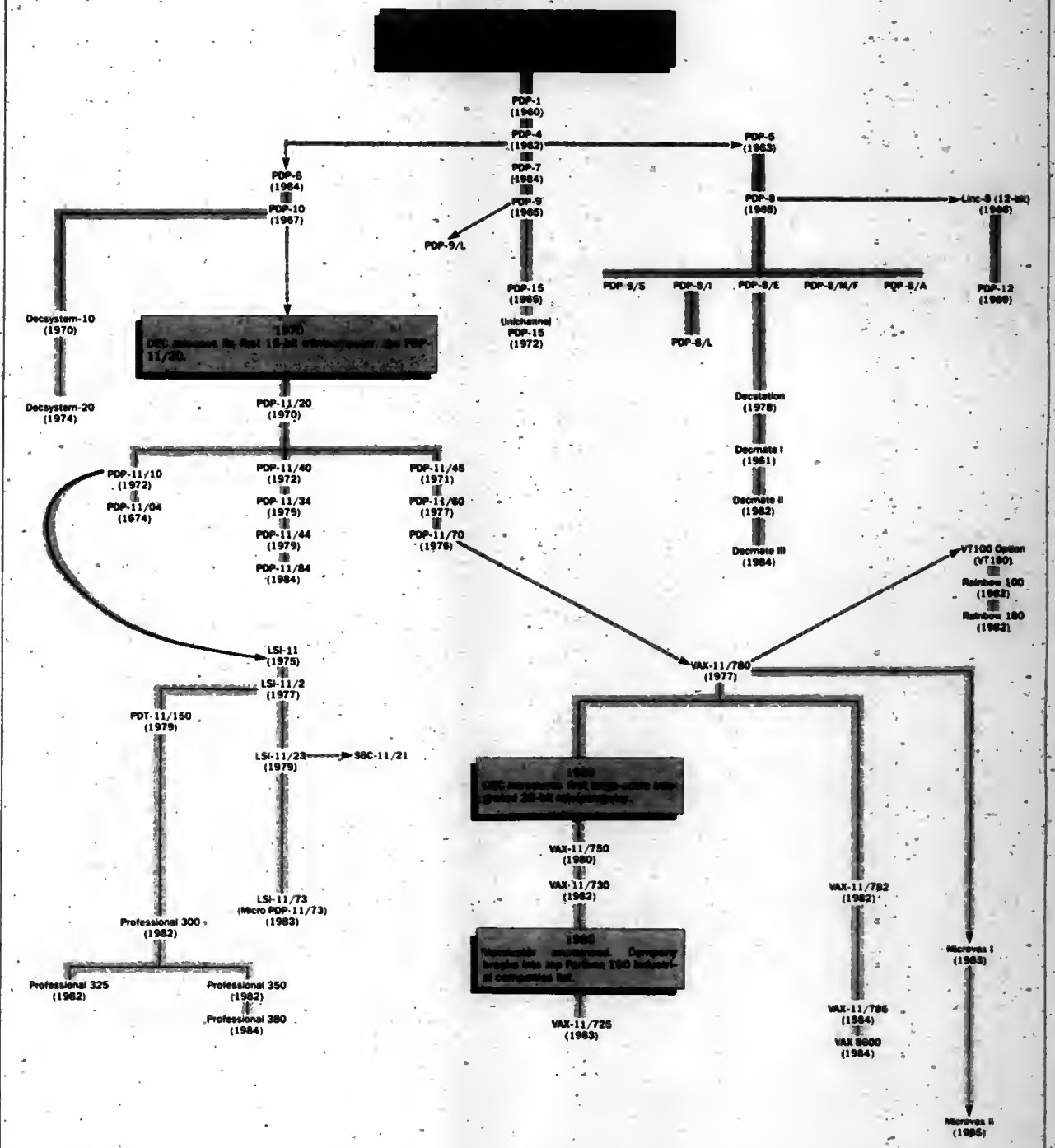

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Through the years with DEC

PDP-5 can run on a PDP-8 and on a Decmate III. The earliest VAX machine's software will run on the Microvax II, he said. "We . . . decided that it would be an architecture that would work from the desktop to the large data center. . . . It took 10 years to get both, but it's still basically the same architecture," he said. The VAX series machines, with their VMS operating systems, are the backbone of the single-architecture, single-operating-system philosophy.

Some DEC customers would disagree that the company adopted a unified approach.

One of the stormiest events in the firm's history occurred in 1983 when the company discontinued its Decsystem line of computers running under the TOPS operating system. The decision left users without a migration path. DEC, the users maintained, promised its Decsystem-10 and -20 customers a bigger and better machine, dubbed the Jupiter project in development, but then dropped the project. The users were stranded with systems that were not easily compatible with the newer VAX line.

The single-architecture philosophy calls for the use of only one version of each programming language, Ken Olsen said. There are about 15 languages, including Cobol, Ada and Fortran, but only one version of each that has been refined continually over the years.

Another of DEC's strategies over the years has been to buy, rather than build, parts for its products that could easily be bought. "However, a number of years ago it became clear that there were certain things we had to design ourselves," said Ken Olsen, in reference to DEC's semiconductor facilities. For pioneering or special devices, such as the chip for the Microvax II supermicrocomputer, DEC now has its own semiconductor design and manufacturing facilities.

To talk to Ken Olsen today is to talk connectivity. Networking and clustering computers are the subjects that fire him up as well as the strategies that propel his company. "Networking is [an] exceedingly complicated business because we have got to tie everything we make together — all kinds of computers — even those that aren't in our main VAX strategy (all those that we made before) — and we have got to talk to other people's computers," he said.

Networking developments include the Decnet Phase III network and Ethernet. A major step for DEC, according to Olsen, was the development of Ethernet, in cooperation with Xerox Corp. and Intel Corp., the networking standard designed to "tie it all together."

In 1983, DEC introduced the Vaxcluster process for tying VAX processors together in a loose coupling scheme. The clustering concept allows customers to tailor systems to their needs, a DEC spokesman said, adding functions such as memory or storage in the needed quantities.

A spate of small business machines released in 1982 — the Professional 325 and 350, the Rainbow 100 and Decmate II — was part of an effort to broaden DEC's position in the office automation arena.

Personal computers are an important part of an overall communications strategy, but they aren't for everyone, Ken Olsen said.

"That's what I was beat up so badly for two years ago — when I wouldn't admit that the personal computer was going to take over everything and that they were just a component in the big system," he said. "Personal computers are . . . basically a key part of off-loading computers, and they will be the terminal of the future," he said.

Olsen may be philosophizing a bit too much, however. When given a choice between DEC and IBM's personal computers, users choose IBM almost every time, according to market research firms. That trend leaves DEC with stockrooms full of Rainbows and Professionals. The systems are still being made but only to order, according to DEC spokesmen.

Ken Olsen said that when he started DEC, he never thought that the company would grow so big or that he would remain in charge for so long. His MIT experiences set the style for a company that would become loosely organized and fairly undisciplined in its design and marketing approaches. That way of doing business worked well for several years because the market was wide open to almost everything DEC was selling, Olsen said.

As the market tightened up, however, the company structure had to be drastically changed, he added. "We moved all the way from 38 product lines to an organization in which what we offer is an integrated network."

Many of DEC's entrepreneurs left at that point, Ken Olsen said. "Some were sure that the company was going to pot because they didn't have the freedom of being independent, or they never talked to so-and-so before and were not about to start," he said.

In engineering, the metamorphosis from the entrepreneurial spirit with little discipline to a structured approach with a lot of discipline has unfolded over a 10- to 15-year period, so the change has not been painful, Ken Olsen said. "You end up with a lot more creativity if you have structure," he said.

Ken Olsen is still running the show at DEC although, he said, "I definitely plan to retire someday." He will not publicly set a date, and without a date, one never leaves, he said. "It's more fun now. I'm more involved in products and strategies."

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Data Storage

■ Wespercorp, Inc. has introduced a universal storage module drive (SMD) disk controller for Intel Corp.'s Multibus computer systems.

The Multibest Model MB-SMD is a single standard printed-circuit board, said to be installable in any available Multibus card slot in the Multibus computer or expansion chassis. It is also said to be software compatible with the Intel iSBC 220 disk controller.

It provides the interface for a disk system of up to four large-capacity removable or fixed Winchester media SMD disk drives at data transfer rates of up to 2.4M byte/sec.

The MB-SMD costs $2,100.

Wespercorp, 14511 New Myford Road, Tustin, Calif. 92680.

■ Sigma Information Systems, Inc. announced a Q-bus tape-cartridge controller for Digital Equipment Corp. LSI-11 systems and QIC-2 drives.

The STC-TSQ11 links a 5¼-in. QIC-2 streaming tape cartridge drive to the Q-bus, providing a bootable back-up for Winchester and other large-capacity disk drives. It reportedly can operate as a file-structured drive as well as a fast streamer and can save or restore 60M bytes of data on a ¼-in. industry-standard tape cartridge in 12 minutes.

The controller emulates the DEC TK25/TS11 and is compatible with LSI-11 series and DEC Microvax II CPUs, the vendor said.

The STC-TSQ11 costs $1,250.

Sigma Information Systems, 3401 E. La Palma Ave., Anaheim, Calif. 92806.

■ California Computer Group, Inc. has announced a line of ¼-in. tape subsystems compatible with Digital Equipment Corp. Microvax systems, designed to speed disk back-up and enable Microvax users to utilize their ¼-in. tape libraries.

The CMQ45-KS reportedly features rates of 45 in./sec. start/stop and 100 in./sec. streaming, both at 800 and 1,600 bit/in. densities. It offers front autoload and autothreading, adjustment-free operation and built-in diagnostics.

The CMQ75-C 75 in./sec. Group Coded Recording (GCR) cache streamer has 128K-byte cache buffers allowing continuous streaming at 75 in./sec.

The CMQ50-T GCR subsystem offers 50 in./sec. start/stop, and the CMQ75-T GCR subsystem offers 75 in./sec. start/stop. Both operate at a density of 800, 1,600 and 6,250 bit/in. They offer autoload and autothreading, resident diagnostics and expandability to up to four drives per controller.

The CMQ200-MS 200 in./sec. cache streamer reportedly backs up an entire DEC RUA81 on a single 500M-byte book-size tape cartridge in 36 minutes.

The CMQ45-KS costs $6,495. The CMQ75-C and the CMQ200-MS both cost $9,995. The CMQ50-T costs $12,950. The CMQ75-T costs $15,250.

California Computer Group, 3303 Harbor Blvd., G-10, Costa Mesa, Calif. 92626.

■ Point 4 Data Corp. has announced the addition of an 86M-byte, 5¼-in. Winchester disk drive to the mass storage devices supported by its Mark 2 computer system.

The addition of the Winchester disk is said to double the capacity of the Mark 2, which is capable of supporting up to seven concurrent users.

The cost of the upgrade is $4,600.

Point 4 Data, 2569 McCabe Way, Irvine, Calif. 92714.

■ System Industries, Inc. has unveiled its CS/80 disk system and a 500M-byte cartridge tape drive for disk backups for the Hewlett-Packard Co. HP 3000 series.

The CS/80 disk system costs $19,000 and emulates HP's 7933 disk drive. It comes with System Industries' 7000 controller and includes a cabinet that houses two systems in one space and a 404M-byte Winchester-based drive. It is said to offer a reliability of 10,000 hours mean time between failure.

The SI 7730 cartridge tape drive features 200 in./sec. streaming mode. It is said to have a mean time between failure of 5,000 hours and can handle up to 500M bytes of data. The 7730 is rack mountable and can be housed in the same cabinet with the CS/80.

The SI 7730 costs $13,500.

System Industries, 1855 Barber Lane, Milpitas, Calif. 95035.

■ Thorn EMI Technology, Inc. has added tridensity recording to its Model 9900 formatted 9-track, ½-in. streaming tape drive.

The IBM/American National Standards Institute/European Computer Manufacturers Association-compatible unit now offers as an option 800 bit/in. nonreturn-to-zero recording in addition to 1,600 and 3,200 bit/in. phase encoding on standard 7-, 8½- and 10½-in. tape reels, the vendor noted.

Recording at 3,200 bit/in. phase encoding, the tridensity 9900 stores 138M bytes of unformatted data on a 3,600-ft tape reel.

Streaming speeds are 25 and 100 in./sec. in the phase-encoding mode and 50 in./sec. in the nonreturn-to-zero mode, according to Thorn EMI Technology.

Other features include single tension arm, intelligent display, built-in diagnostics, see-through tape path cover and optional true start/stop recording.

The OEM price for the Model 9900 with tridensity recording is $3,700 in quantities of 250.

Thorn EMI Technology, 3601 Dunwoody Place, Atlanta, Ga. 30338.

This is no way to manage a network.

It takes more than wishful thinking to keep a network up and running. Particularly if you're working with more than one vendor and coordinating resources in many locations. Just by adding users, small problems can turn into big ones and, before you know it, your network's down from here to Hong Kong.

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There's more. The Codex 4800 Series can generate reports for tracking, analysis, and forecasting...all of which you need for making the right decisions at every organizational level.

The Codex 4800 Series Network Management System is so fast and so smart, you can spot potential problems and react much more quickly to changes in the environment. And, since it's totally independent of your mainframe, you get status information without affecting ongoing operations.

The system works with the industry's most-preferred networking modems from Codex, and includes a raft of other features to make your network more effective. You have greater operational control, improve your cost efficiency, and ensure optimum network uptime.

Whether your network is large or small, Codex has the network management system that will meet your needs and grow right along with your business.

So uncross your fingers and reach for the phone. Call **1-800-426-1212, Ext. 281,** for more information on the new Codex 4800 Series Network Management System. Or write Codex Corporation, Dept. 707-281, 20 Cabot Boulevard, Mansfield, MA 02048.

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PERFECT FIT

THE NEW VECTRA PERSONAL COMPUTER

FROM HEWLETT-PACKARD.

In today's fast-moving business environment, you need a personal computer that has the flexibility to fit perfectly with changing business needs and opportunities. The new Hewlett-Packard Vectra PC is just such a computer: flexible and versatile.

You get the *performance* you need, because you can select the power, speed and memory capabilities that suit you best; the *software* you need, because it's compatible with the IBM PC/AT; and the *hardware flexibility* you need, because it's designed to access a full range of accessories and peripherals.

The HP Vectra PC is a high performance computer. It's 30% faster than the IBM PC/AT. And with the addition of the optional co-processor, it can run even faster.

And since the Vectra PC is compatible with the IBM PC/AT, it runs PC-DOS 3.1 programs—without alteration. Like Lotus® 1-2-3,® MultiMate,™ and R:BASE™ 5000, plus HP's new AdvanceWrite word processing series, TextCharts presentation graphics, and more.

There are several internal and external memory storage

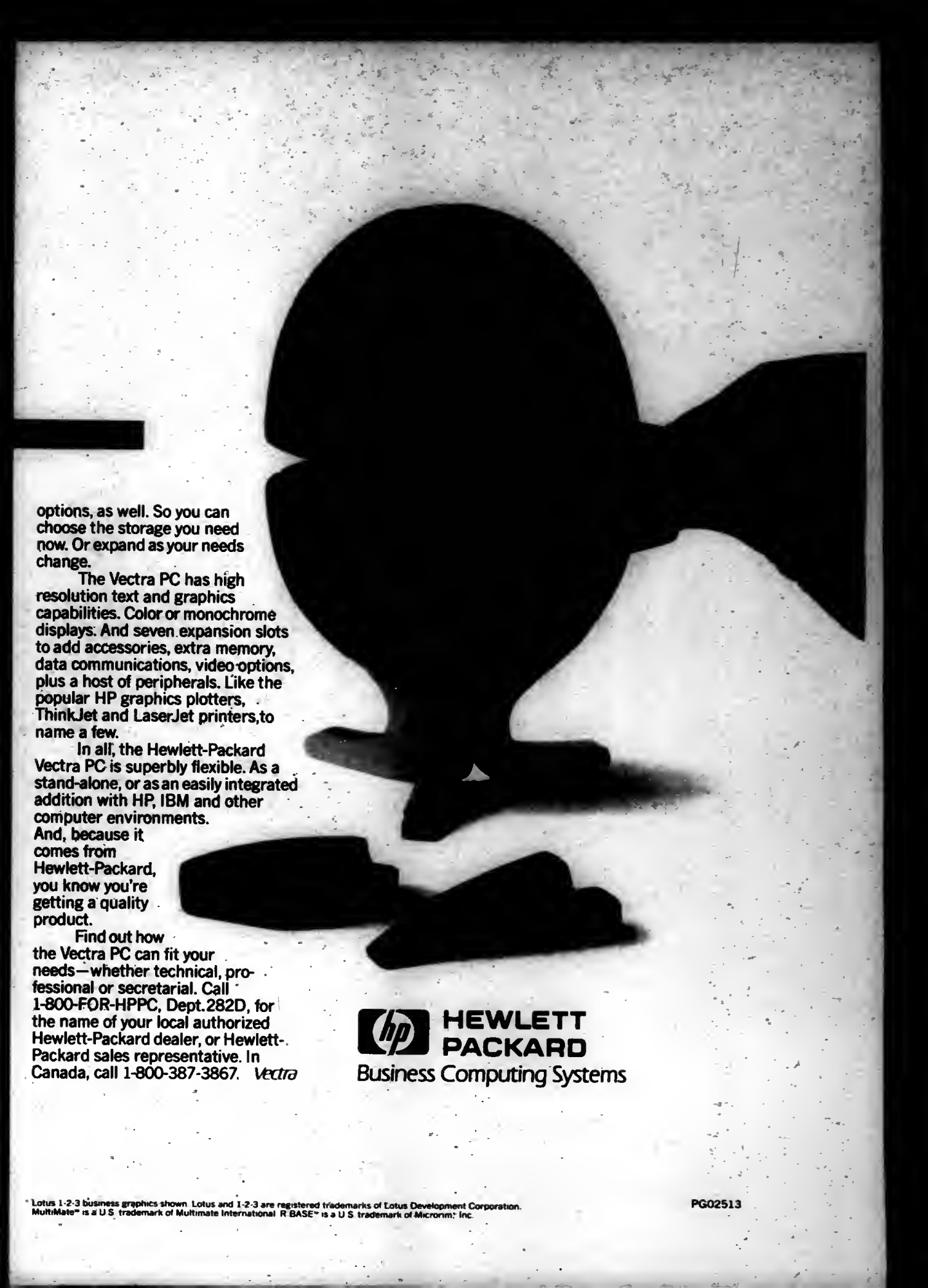
HP Vectra Specs.

MEMORY
256K expandable to 3.64MB

MICROPROCESSOR
Intel 80286, runs at 8MHZ
Optional: Intel 80287; co-processor runs at 5.33 MHZ

OPERATING SYSTEM
MS-DOS 3.1 (compatible with PC-DOS 3.1)

DATA STORAGE
5¼" internal flexible discs (360K or 1.2MB capacity)
20MB internal hard discs
3½" stand-alone flexible discs; 20MB stand-alone hard disc



options, as well. So you can choose the storage you need now. Or expand as your needs change.

The Vectra PC has high resolution text and graphics capabilities. Color or monochrome displays. And seven expansion slots to add accessories, extra memory, data communications, video options, plus a host of peripherals. Like the popular HP graphics plotters, ThinkJet and LaserJet printers, to name a few.

In all, the Hewlett-Packard Vectra PC is superbly flexible. As a stand-alone, or as an easily integrated addition with HP, IBM and other computer environments. And, because it comes from Hewlett-Packard, you know you're getting a quality product.

Find out how the Vectra PC can fit your needs—whether technical, professional or secretarial. Call 1-800-FOR-HPPC, Dept. 282D, for the name of your local authorized Hewlett-Packard dealer, or Hewlett-Packard sales representative. In Canada, call 1-800-387-3867. *Vectra*

HEWLETT PACKARD

Business Computing Systems

* Lotus 1-2-3 business graphics shown. Lotus and 1-2-3 are registered trademarks of Lotus Development Corporation. MultiMate™ is a U.S. trademark of Multimate International. R:BASE™ is a U.S. trademark of Microrim, Inc.

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There's only one way to evaluate the performance of a fourth generation language database management system. Test drive it. Put it to work developing applications for actual problems.

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The world's premier 4GL/DBMS

SYSTEMS & PERIPHERALS

TERMINALS

■ **Applied Digital Data Systems, Inc. has released its Viewpoint/122, a top-of-the-line Digital Equipment Corp. VT220-compatible terminal.**

The Viewpoint/122 also emulates DEC's VT100 and VT52 terminals, the company said. Features include variable smooth scrolling, a bidirectional printer port and a nonglare green screen (amber optional). All 16 of DEC's multinational character sets are accessible via a multilingual setup mode. The terminal has a 12-in. diagonal screen with a 24-line by 80- or 132-col. display.

The Viewpoint/122 costs $795.

Applied Digital Data Systems, Display Products Division, 100 Marcus Blvd., Hauppauge, N.Y. 11788.

■ **Tektronix, Inc. has announced a member of its 4100 series computer-aided design terminals tailored to electrical engineering, mechanical drafting and structural analysis tasks.**

The system can be connected to any minicomputer with an RS-232 interface, the vendor said. The 4111 terminal features graphics functions such as multiple views, local picture segments, fast panel fill and patterning. It provides 256K bytes of local random-access memory for temporary storage of picture elements.

The terminal has a 19-in. color raster display with 1,024- by 768-pixel resolution. Sixteen colors can be simultaneously displayed from a palette of 4,096 separate shades, the vendor said.

The unit costs $12,950.

Tektronix, P.O. Box 500, Beaverton, Ore. 97077.

■ **Tab Products Co. has introduced a Digital Equipment Corp. VT220-compatible terminal.**

The E-22 display terminal includes characters that are said to be 49% larger than the VT220s in the 80-col. mode and 47% larger in the 132-col. mode.

It features a 15-in. screen, 15 user-programmable function keys and eight soft function keys for terminal setup.

The unit costs $799, according to the vendor.

Tab Products, 1400 Page Mill Road, Palo Alto, Calif. 94304.

■ **Tektronix, Inc. has released its 4100A series of computer display terminals.**

The 4100A series is similar to its predecessor 4100 series but is said to have enhanced Digital Equipment Corp. VT100 compatibility. Those enhanced features include media copy and answerback and additional graphics manipulation capabilities, according to the vendor.

It also supports additional I/O devices such as Hewlett-Packard Co.'s Thinkjet printer, the Epson America, Inc. FX-80 printer and Centronics Data Computer Corp.-compatible copiers, the vendor said.

The series includes eight models that range in price from $2,995 to $9,995.

Three of the models are IBM 3270-compatible as well as DEC VT100-compatible.

Tektronix, P.O. Box 500, Beaverton, Ore. 97077.

■ **Graphon Corp. has introduced its GO-200 family of terminals that emulate Digital Equipment Corp. and Tektronix, Inc. terminals.**

The GO-220 terminal emulates the DEC VT220 and VT100 terminals and is said to offer one display mode using DEC's 10- by 10-char. cell and a second mode using a denser 13- by 15-char. cell. It provides 24, 25 or 26 lines of display. The GO-220 costs $995.

The GO-230 is like the GO-220 but adds emulation of the Tektronix 4010 and 4015 graphics terminals with full Tektronix horizontal resolution and one-half the vertical resolution — 1,056 by 391 pixels. Alpha and graphics planes can be simultaneously displayed. It costs $1,295.

The GO-240, priced at $1,895, is said to be compatible with DEC's Regis graphics language. It supports mouse or digitizer pointing devices. Features include up- and downloading of the 2-bit map planes and pan and zoom functions, a third communications port and 90 programmable function keys. The top-of-the-line GO-250 is said to provide all of the above with full 1,056- by 782-pixel resolution. Up to 20 pages of text and four pages of graphics can be locally held. The GO-250 costs $2,495.

Graphon, Tower One, Fifth Floor, 1901 S. Bascom Ave., Campbell, Calif. 95008.

■ **General Electric Co.'s Calma Co. has announced a 20% average price reduction for its Apollo Computer, Inc. DN660-based computer-aided engineering (CAE), design and manufacturing workstations.**

The four Calma Apollo DN660-based systems are configured with design, drafting and manufacturing software for the mechanical market; Dimension III software for the architecture/engineering/construction market; Tegastation CAE/CAD software for electronics applications; and T-Boards software for printed-circuit board design.

The new price range is from $72,000 to $112,000.

Calma, 501 Sycamore Drive, Milpitas, Calif. 95035

■ **Direct, Inc. has announced a Hewlett-Packard Co. 2392A-compatible terminal.**

The Direct 8392 is said to offer 80- and 132-col. display and a 14-in. tilt-and-swivel monitor with a choice of green or amber display. It has an RS-

Continued on page 106

Wang's J. Carl Masi on IBM and architectures

At the recent International Society of Wang Users meeting in Boston, Wang Laboratories, Inc. Executive Vice-President J. Carl Masi was interviewed by *Computerworld* Senior Editor James Connolly in connection with Wang's decisions to emphasize IBM connectivity and to open its architectures to other vendors.

What does IBM compatibility and open architecture mean to the user?

For the last two years, millions of personal computers, most of them IBM, were pumped into the offices of businesses large and small.

We were in a position before the Wang Office Center interfaced to the IBM Personal Computer where the IBM salesman would say to the customer, "You've got my IBM mainframe and my IBM Personal Computers; why not put in a System/36 to act as a departmental processor or a cluster controller and make those micros more productive?" Those very Personal Computers were sold without the need for a departmental processor; now [IBM] is coming in and saying, "Buy my System/36."

By Wang offering a local and a remote connection to that IBM Personal Computer, it allows us to say, "Wait a second, we've got a [Wang] VS computer here; compare it with your System/36. Go ahead, benchmark it, compare it. Look at its price/performance, look at its growth capability, look at the software that it has, the Wang Systems Network interface, and make your own decision as to which is the better departmental processor — the VS or the System/36." Without having that interface into the IBM micros, we were locked out of that market.

How did that decision come about?

Just a whole lot of customer demand. To be honest with you, it took us about a year and a half to make the decision.

What was actually involved in preparing for the announcement?

About two months of design engineering; that's all there was. The real resistance was impact on our own workstation product line. But let's face it, there are far more IBM Personal Computers out there on the desks than there are Wang workstations and Wang micros. So the strategic direction, the strategic effect, was to take a case where IBM had already captured the desk with an IBM Personal Computer and to make a Wang micro by tying into a Wang VS running Wang Word Processing, Wang Office and all of the other Wang functions.

Was the decision to open the architecture made at the same time?

It was a continuation of our stated direction to open the architecture to become less of a closed company and to open up our architecture to what was available in the industry.

What does that offer to the customer?

It offers him the ability to place Wang in his current environment in a way that allows all of those past investments in hardware technology and software technology to remain robust.

AN INTERVIEW

Wang's J. Carl Masi

I'll give you an example. In London there are many banks where we are selling our Wang VS with Wang Systems Networking as what we call our presentation services product. There you have [Prime Computer, Inc.] or [Data General Corp.] or [Digital Equipment Corp.] systems in the bank doing a number of different applications.

But the actual presentation of all those services to the end user is networked on a Wang screen with Wang VS 15s or Wang VS 65s acting as network process controllers tied into the Prime or DEC. We couldn't have done that had we not gone through the effort of opening up our networking and architecture to accommodate everyone else's product line.

So the role of Wang could end up in many situations as the middleman?

You use the word "the"; we say "a role." We sell to two different classes of users. One is the office environment where, generally, our users are nontechnical office workers, and that is our traditional market. That's where you take a technology and apply it very simply. That's where those 90,000 [Wang Office Information Systems] were placed. So part of our strategy is to continue to grow with that business, to make it happy, to expand it into more and more networked data processing applications and to attract other users.

At the same time, we must invest in the needs of the information system executive and the MIS organization managers both as end users of our products and as key decision makers.

In that MIS market, we sell our product four different ways. One is the way you suggest, as a middleman, as a network processor with excellent network control software called DMF. Second is as a departmental processor — that's the VS vs. System/36. Third is as a host processor in small and middle-size companies and in the departments, branches or subsidiaries of larger companies. Fourth is as an application software developer for the host computer as well as for the VS.

With respect to your traditional customer, you've made a point of saying that you are not abandoning that customer.

I said the office — we are not abandoning the office. The office is still the beginning and the end of each direction that we take.

How far away are you from tying that office into everything else, including that IBM world?

I think we are there. We have Profs [IBM Professional Office System]; we can demonstrate it. Disoss [IBM Distributed Office Support System] is a committed project which we will have. That is only one of the knits of the integration, of the networking, of the coexistence.

We have a tremendously rich array of road maps and paths. I think we are much more advanced than most in the integration of all four forms of information into our data base and in our networking. So, while we are continuing to integrate and increment the base technologies, we must focus on the areas where we can provide clear-cut and obvious market distinction, and in that area, we now are focusing on the imaging and the voice and the telephony products.

What other directions can we look for in open architecture or compatibility, looking six months or two years down the road?

Accepting as our premise the fact that data processing is moving into the office and we are there and accepting the fact that we never sell a straight word processing application any more — that we always sell an integration of data, word processing and

Continued on page 108

Honeywell has better office integration than Wang or IBM.

That's right.

Introducing The Honeywell Office

Honeywell is about to change the way you think about office automation.

Because standalone and non-compatible product lines aren't enough to provide the most dramatic increases in productivity and corporate profitability.

The biggest increases in performance can only come from office automation capabilities like integration and networking that allow all systems to "talk" to each other—which is why we designed The Honeywell Office.

The Honeywell Office integrates office processing, data processing, networking and communications, and distributes these resources across a single, compatible product line of micros, minis, and superminis.

It's the reason why one customer credited our approach to office integration with helping to increase sales by 50%.

Here's how The Honeywell Office can help you manage and direct your information resources more efficiently.

Honeywell ties PC processing and terminals into one departmental system.

Unsurpassed Office Processing

We started with competitive word processing in virtually every area and developed superiority in the crucial area of file management.

INFOCALC, our three dimensional spreadsheet, lets you merge financial data and text.

But we didn't stop there.

We integrated decision support tools and distributed networking capabilities so that your departments can transfer, share, and combine office and data processing information with simple commands. Without unnecessary steps. Without costly duplication of efforts.

InfoCalc, our integrated spreadsheet, lets managers access information from the department across the country as easily as the sales office from across the corridor.

There is also a database management capability that allows professionals to set up their own departmental databases.

And that's only half of it.

The other half is how *well* it integrates the office side of your business with the data processing side.

Flexible Data Processing

No word processing vendor can integrate the extensive array of data processing products you'll find with The Honeywell Office.

The Honeywell Office provides unrivaled flexibility by combining office and data processing into one distributed, departmental system. It supplies integrated transaction processing, database management, program development tools, query and report, data entry and specialized industry applications.

So now your accounting, marketing, and other departments can access and control their information.

	The Honeywell Office*	OIS/VS	IBM 36/ IBM 5520
• Compatible Product Line	Yes	No	No
• Consistent User Interface	Yes	No	No
• Integrated Word & Data Processing	Yes	VS Only	Limited
• Full Office Processing Capabilities	Yes	VS Only	Limited
• Integrated Spread Sheet	Yes	No	No
• Easy to Use Programming Tools	Yes	VS Only	No
• Query & Report Facility	Yes	VS Only	Limited
• Data Entry Facility	Yes	Limited	Yes
• User Application Interface	Yes	Limited	Yes
• X.25 Networking	Yes	VS Only	Yes
• SNA Networking	Yes	VS Only	Yes
• Exceeds ISO Networking Standards	Yes	No	No
• Electronic Mail—Peer to Peer	Yes	Limited	No

*Over 2000 installations.

And when it comes to writing new applications, we offer a full complement of programming languages that include BASIC, COBOL, FORTRAN, ASSEMBLY, ADA, C, RPG, and PASCAL.

Quite simply, The Honeywell Office gives you a better growth path, stronger database management, and greater systems flexibility than our competitors.

Honeywell.

Advanced networking lets you connect all your departments.

Integrated Networking and Communications

Honeywell expertise in networking and communications helped the Metropolitan Life Insurance Company create one of the largest distributed branch office networks of its kind.

Over 1300 Met Life district sales offices in North America are automated using our DPS 6 minicomputers, linked through an SNA network that supplies reliable branch office-to-IBM host communications.

Unlike competitors who require mainframes for network control, we aren't limited to creating star networks. Our ISO based Distributed Systems Architecture (DSA), gives you the flexibility to configure ring, mesh, peer-to-peer, and other styles of networks.

For local and remote user-to-user communications, our integrated electronic mail helps minimize network costs by letting you route your mail and documents in economical quantities, and prioritizes transmission by time of day.

Finally, The Honeywell Office lets you access network services such as CompuServe, Dow Jones, The Source and Westlaw right from your desktop.

Complete Micro to Mini to Supermini Compatibility

From the very beginning, The Honeywell Office was designed for complete compatibility from top to bottom. Compatible hardware. Compatible software. And compatible communications facilities.

One consistent interface is presented to all systems, small and large, permitting the virtually limitless exchange of information. Standard menus and prompts provide major user training benefits. Upgrade options are more flexible and economical because all systems can be linked together.

Honeywell's complete micro to supermini compatibility means flexible, economic growth.

Service and Support that Make All Systems Go

The Honeywell Office is backed by TotalCare,™ our comprehensive nationwide support program.

Uptime, after all, is everything, and TotalCare™ provides everything you need in programs and services that can be tailored to help meet your requirements.

The Honeywell Office The Smarter Choice

The Honeywell Office reflects a strong commitment and adherence to a standard interface, state-of-the-art technology, and a modular, open ended design, so that your office can grow as your needs do.

For more information call 1-800-328-5111, Ext 2783. Or write: Honeywell Information Systems, 300 Concord Rd., MS 810, Billerica, MA 01821.

Honeywell 100 Years

Together, we can find the answers.

Honeywell

From page 104

Wang's Masi on IBM and architectures

networking functions — and accepting the fact that nearly all of our installed base is upgrading the systems they bought originally, we are working in the areas I mentioned to provide clear-cut, unique distinctions, and we'll be adding more and more types of users to our repertoire.

What makes Wang the company that it is today is that we focus on a specific class of worker in an office, and we develop some proprietary software and hardware.

It's a complex technology, but we provide it in a simple-to-learn, easy-to-use way in an office environment, and our users just build the demand.

Our first product [a product to calculate logarithms] was aimed at a specific business problem that a particular user had. We went from there to bond traders to automobile dealers to accountants to secretaries to professionals, in each case understanding their job and understanding what we could do to provide improved productivity to their functions. In each case, the product had to be very simply applied so there wasn't a great learning curve and so it was accepted rather than taught.

Our future will involve picking out additional classes of users and doing the same thing. We are targeting this year two classes of users — the design engineer, who after all is just a professional office worker with serious productivity problems, and the software developer, another professional office worker with serious productivity problems.

When you say design engineers, you're not thinking of putting together an Apollo Computer, Inc.-type of workstation, are you?

It's not an Apollo workstation, but it's a workstation that does design engineering functions. It's not an announced product, but it is shown on the third floor. It's not a [computer-aided design and manufacturing] system.

So is it more of a workstation that will add some function for that engineer?

It integrates under Wang Office, so it provides a combination of the office-type functionality and the professional-type functionality in one system. It also drives our imaging technology.

What we are doing for that, we have to do for our other imaging products because of the resolution and size of the screen sort of thing. So, it is being used as a stimulus for further direction.

There is one other thing I would like to mention in terms of where I see this development going, at least within our own company, and this is blue sky. I said we focused on the particular types of users.

More and more, with the advent of artificial intelligence and expert technology, our systems will be learning about what the individual is doing as a particular type of user in that subset.

The systems will be adapting themselves over time not only to the class of user but to that individual's preferences and priorities. That is the real exciting stuff, because you can optimize and make the class more productive, but then you can really make some advantages if you can optimize for the individual.

Again, I must underline that it is blue sky and nothing you will see announcements on now, but we are doing a lot of development work on it.

Continued from page 103

232 serial port and optional RS-422, printer and RS-232C bidirectional interfaces. The keyboard is said to be fully enhanced.

The Direct 8392 costs $1195.

Direct, 4201 Burton Drive, Santa Clara, Calif. 95054.

■ **Hi-Tek Corp. has announced the PC-122 keyboard, a 122-key low-profile keyboard that emulates the IBM 3270 Personal Computer keyboard and layout.**

Along with the IBM 3270 keyboard configuration, the DIN standard PC-122 adds LED indicators in the Num Lock, Scroll Lock and Caps Lock key switches and allots space for four extra keys.

The PC-122 keyboard with case and cable costs $85 in 10,000-unit quantities.

Hi-Tek, 7274 Lampson Ave., Garden Grove, Calif. 92641.

From page 87

Micros moving in engineering

ing engineering problems. A typical engineering problem might be the structural analysis of a high-rise office building. Although many engineering problems can be solved only on mainframes and minicomputers, engineers have found that microcomputers can solve a large class of small problems.

In the petrochemical and nuclear power industries, for example, analysis of piping systems is a task that long was restricted to the mainframe. Several programs are now available on microcomputers for analyzing small- to medium-size piping systems.

Many of the microcomputer engineering packages enable uploading and downloading to and from the mainframe for preprocessing and postprocessing of larger engineering problems.

By using microcomputers for some of their analysis work, engineers reduce their dependence on expensive mainframe hardware and can price their work competitively.

Project management and data tracking are two other areas where engineers are turning to microcomputers. With programs such as 1-2-3, engineers can estimate manpower requirements and costs. Data base management programs such as Dbase II are becoming popular for maintaining lists and project records.

Software and cost are the two major factors affecting the micro/mini battleground. Despite the power of 32-bit minicomputers, the software available on these machines is generally more difficult to use and less flexible than comparable microcomputer software. For example, spreadsheet and business graphics software advertised as comparable to the 3-year-old 1-2-3 recently became available on minicomputers.

A major reason for the discrepancy between microcomputer and minicomputer software is the lack of standards in the minicomputer market: Microcomputer software developers create their software for one operating system supporting a single user with a standard terminal. With IBM PC-DOS as the standard operating system, developers enjoy a market of millions of users.

Minicomputer software developers face a different operating system for each vendor. In addition, multiuser minicomputers generally support a variety of terminals, which complicates development. The user base for each type of minicomputer is far smaller than the PC-DOS microcomputer user base, making development more costly and more risky.

The cost per user on micros and minis is another major factor in the battle. Typical minicomputer systems for medium-size engineering firms are priced from $250,000 to $500,000. Such systems support 30 to 60 users but are generally used by about half that many at one time.

As minicomputer users know, performance can be slow when the number of users approaches the machine's limit. Factoring in the cost of maintenance — about 10% of the purchase price per year — and assuming that 50% of the maximum number of users are on the machine at one time, the cost per user comes to about $20,000. For $20,000, a firm can buy three hard-disk microcomputer systems with three printers. The cost per user on a microcomputer system is well under $10,000.

Another consideration is the price of software. Engineering software on minicomputers is generally leased with costs ranging from $1,000 to $5,000 per month. Microcomputer engineering software is generally purchased outright for $500 to $3,000.

The more advanced applications in engineering probably will stay in the domain of the mainframe and mini for years to come. Some of the problems in the aerospace and defense industries require significantly more power and memory than are available on micros and supermicros. On the other hand, a growing number of problems are solved readily on micros.

In addition, the business and project management software available on microcomputers is proving to be superior to comparable products on minicomputers. Engineering firms will gradually reduce their dependence on minis and mainframes and turn to microcomputers for solving their everyday tasks.

COMPUTER INDUSTRY

INDUSTRY INSIGHT
Clinton Wilder
CW Staff Writer

Rebound may be on hold

The quarterly financial reporting season is upon us once again, and we do not expect a major third-quarter rebound in any industry segments — mainframes, minis, semiconductors or software. Preliminary indicators to this point have not augured well, and Herbert Hoover's legendary "corner" that prosperity was "just around" back in 1932 still seems to be a few quarters off for the computer industry.

The most encouraging sign for the major vendors in recent weeks has been the drop of the dollar abroad. The companies say the less lopsided exchange rate will keep their overseas sales growing as well as boost the fortunes of major U.S. exporters in other fields — that is, the companies that haven't been buying many computers lately. On the other hand, the dip in Hewlett-Packard Co.'s European revenue could be very troubling [CW, Aug. 26].

Everyone agrees that the less mature European market will eventually follow the pattern of that in the U.S., meaning a slump will strike at some point. The question is when. Few expect it to begin in 1985, but time will tell. If it does, the weakened dollar may only mean that another scapegoat for the industry's more deep-seated troubles — such as overexpansion, overcapacity and satiated demand — will no longer be valid.

As we anticipate third-quarter report cards from the mainframe makers this week, the Wall Street bulls still seem pretty restless in their pens. When Burroughs Corp. began the month by announcing that its quarter

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Meeting spurs discussion between lessors, lessees

By Charles Babcock

NEW YORK — Computer leasing is a field in which few get an education except through experience, and the experience is not always pleasant, according to attendees of the first-user-oriented Computer Leasing Conference and Expo (Comlease) held earlier this month.

The 200 representatives of companies that lease rather than buy their equipment found much to discuss at the show, which targeted first users.

The most pressing issues were the pros and cons of leasing, the so-called "hell or high water" clause in leasing contracts and the proposed elimination of the investment tax credit.

"When you are isolated, you don't know if you are doing it right. I've been able to verify we're not way out on a limb," said Larry Corea, project analyst for leasing at Carolina Power & Light Co. in Raleigh, N.C.

"Leasing has not traditionally been the province of data processing. In the past, somebody in purchasing or accounting has handled it," said Frank Stairiker, computer systems analyst for National Liberty Life Insurance Co. in Valley Forge, Pa.

Both Stairiker and Corea are examples of people who have left more traditional data processing roles to become specialists in computer leasing, and they said they found the conference helpful. "It takes you out of the vacuum you're operating in," Stairiker noted.

The interest in leasing issues did not carry over to the thinly attended exhibition hall, however, where only 16 compa-

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From president to legislator

INTERVIEW

As trade and tax legislation take center stage in the U.S. Congress, Rep. Ed Zschau (R-Calif.) — the congressman from the Silicon Valley — is playing a key role on the Republican side. Zschau founded an electronics company, System Industries, Inc., and served as its president for 13 years before entering Congress in 1982.

During his business career, Zschau was a leader of the American Electronics Association and used that experience as a springboard to a political career.

Rep. Ed Zschau from Silicon Valley

In a recent interview with *Computerworld*'s Washington, D.C., correspondent Mitch Betts, Zschau discussed the high-technology trade and tax issues confronting Congress.

What prompted you to leave industry to run for Congress?

[I felt that] people who know where jobs come from and how they're created and how the process works and what it takes to create technology and exports — all these things that everybody wants — would be in a position to assess whether government policies were conducive to that or whether they were stifling it. So I felt I could make a difference.

Are you having the kind of influence you wanted to have?

Yes. I was given a lot of really good opportunities. I was, as a freshman, appointed to the Foreign Affairs Committee, . . . and one of the major bills before the com-

Continued on page 117

Atex selects AT&T as vendor in open-ended OEM contract

BEDFORD, Mass. — AT&T won a major commercial OEM contract recently when Atex Corp., Eastman Kodak Co.'s electronic publishing systems subsidiary, selected AT&T's Computer Systems Division as its high-end CPU vendor.

The current Atex newspaper and magazine text processing systems are based on the Digital Equipment Corp. PDP-11 series of minicomputers, and many industry observers said they expected Atex to migrate to a larger DEC system, such as the VAX 8600.

But Atex's Frank Ingari, program manager for the Total Publishing Environment system, said Atex decided early in the 10-month selection process that it needed a fault-tolerant machine, which DEC does not produce.

"The VAX line is designed for high availability but not fault tolerance," Ingari said. "So much of newspaper and organization management is dependent on fault tolerance. The DEC front end will continue to handle the text and image processing, but the AT&T system will manage all the information on the status and location of each text or image file. The criticality of that data base requires fault tolerance."

The length of the multimillion-dollar contract is open ended, and Ingari estimated it at seven to 10 years. He called the deal "a sizable one" for AT&T.

Some of the AT&T hardware specified in the contract is still in the development stage, but, Ingari said,

Continued on page 125

CBEMA eyes 11.5% surge in 1985 high-tech sales

WASHINGTON, D.C. — Revenues from the sale of computer hardware, software and DP services will increase 11.5% to $141.7 billion this year, up from $127.1 billion in 1984, a computer trade group predicted recently.

But the statistical report from the Computer and Business Equipment Manufacturers Association (CBEMA) predicted that there will be no growth in sales revenue for mainframe computers this year.

In its report, CBEMA said sales of software and related services are expected to grow at a rate of 15.5%, from $35.3 billion in 1984 to $40.7 billion this year.

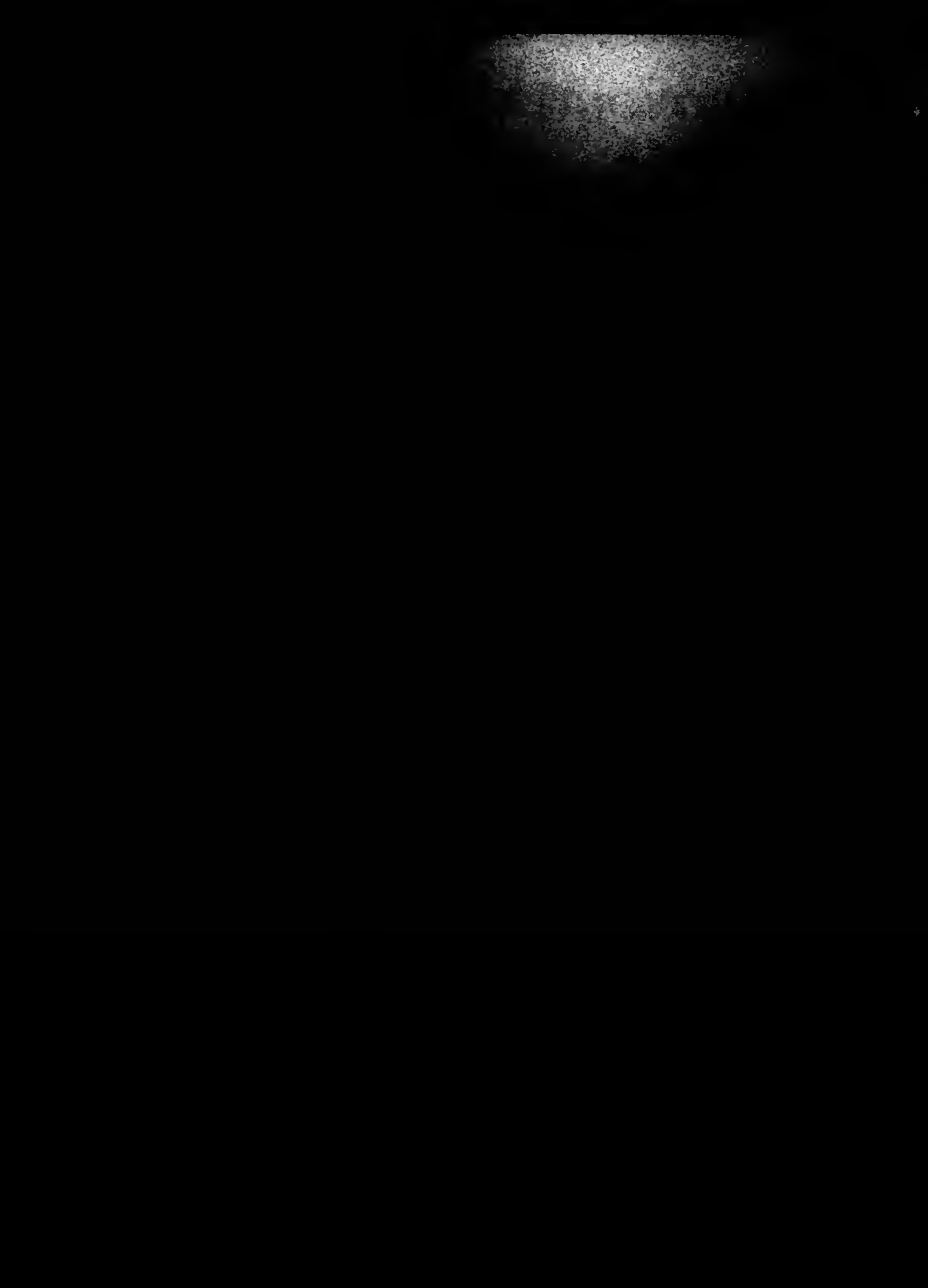
Revenue from computer hardware and from services is projected to increase 10%, from $91.8 billion to $101 billion, according to CBEMA.

Micro, mini sales expected to grow

A breakdown of the computer sales figures presented in the report showed that microcomputer sales will increase 10% to $8.6 billion this year; minicomputer sales will grow 11% to $4.7 billion; and mainframe sales will remain at the 1984 level of $10.6 billion.

The projections are drawn from CBEMA's "Computer and Business Equipment Marketing and Forecast Data Book," according to a CBEMA statement that was released last week.

CBEMA also projected that revenue for word processing workstations will increase 4% to $3.2 billion this year.



Patenting software possible but tough to accomplish

SEVENTH IN A SERIES

By Jerome J. Roberts
and Michael P. Brownell
Special to CW‡

Patent protection enables a patent owner to prohibit others from making, using or selling a patented invention in the U.S. for a period of 17 years. This protection is available even against a person who, subsequent to the date a patent is issued, independently creates an infringing invention without knowledge of the previously patented invention. As such, a patent confers a statutory monopoly upon the patent owner.

To receive patent protection, a software owner must initially qualify its software as either a "process" or "machine" as those terms are defined by the Patent Act of 1952. Patent protection will not be awarded for ideas, algorithms, laws of nature, scientific principles or mental processes.

Because computer programs are essentially composed of logic, algorithms and mathematical formulas, the U.S. Patent & Trademark Office has characteristically received patent applications for computer programs with skepticism, if not hostility. Nevertheless, software does not constitute an inherently unpatentable subject matter, and patents have been issued for processes and machines consisting of or based upon computer programs.

Even though a software application may qualify as eligible subject matter, a patent will not be issued unless such software is "useful," "novel," "not obvious" and "adequately disclosed," as those terms are defined under patent law. Unlike the originality requirement of copyright law, meeting the aforementioned patent requirements, particularly the novelty and nonobviousness requirements, imposes a substantial burden on the patent applicant.

To date, patent law has not been widely embraced as a form of proprietary protection for computer software. Several reasons underlie such reluctance:

- The eligibility of computer software for patent protection has been and will continue to be a topic of dispute, with the Patent & Trademark Office remaining generally opposed to such eligibility.
- Filing a patent application and steering it through the Patent & Trademark Office is a demanding exercise, and the attendant costs can be quite high, almost always including the service of a patent lawyer.
- The application process may consume several years. A software product may be well into its product life cycle, if not technically obsolete, by the time a patent is issued.
- Issuance of a patent does not ensure certain patent protection against infringement. Defendants in patent infringement cases have the right to prove, and are very often successful in proving, that the relevant patent was improperly issued and, therefore, that no infringement has taken place.
- Finally, patent protection for computer software may mean forgoing trade secret protection to the extent that the disclosure requirement of patent law requires disclosure of software elements otherwise eligible for trade secret protection.

Roberts and Brownell are attorneys with the law firm of Berman, Roberts and Kelly in Chicago. The firm's practice deals with legal issues related to procurement, distribution, management and protection of computer resources.

Ashton-Tate buys Multimate

CULVER CITY, Calif. — Ashton-Tate put the final wraps on the microcomputer software industry's largest acquisition to date last week, agreeing to final terms for the $20 million cash-and-stock purchase of software vendor Multimate International Corp.

Ashton-Tate expects to conclude the previously announced deal by the end of December. The terms call for Ashton-Tate to pay Multimate $8.5 million in cash and 983,530 shares of stock for the privately held East Hartford, Conn.-based vendor of micro word processing and other software. Ashton-Tate's stock was recently trading at approximately $12 per share on the national over-the-counter-market.

Multimate Chairman Wilton H. Jones and Executive Vice-President Richard A. Lefebvre will be employed by Ashton-Tate for six months after the merger. They agreed to limited covenants prohibiting their competition against Ashton-Tate for a subsequent two-year period.

The merger, still subject to Multimate shareholder approval and other conditions, makes Ashton-Tate the second-largest micro applications software vendor behind Lotus Development Corp.

Software maker Borland International buys Analytica

Borland/Analytica reduces Reflex price

By Peggy Watt

SCOTTS VALLEY, Calif. — Borland International, trailblazer of inexpensive microcomputer business software, recently announced it has acquired Analytica Corp. of Fremont, Calif., the 2-year-old manufacturer of the data base analysis system Reflex.

The effects were immediate: Analytica now identifies itself as Borland/Analytica and sells a repackaged, non-copy-protected version of its data base, renamed Reflex: The Analyst, at a Borland-like price of $99.95. In addition, a Borland representative said that all current Reflex owners will receive a complimentary copy of Sidekick, its popular desktop management system, and customer discounts on other Borland products.

About a dozen of Analytica's 17 employees will join Borland, representatives of the firms said. Cofounder Adam Bosworth opted to join Borland; his colleague Eric Michelman did not. After the transferring employees move to Borland's Scotts Valley headquarters, a Borland spokeswoman said, "Analytica will no longer exist as a separate company."

Michelman said Borland's "marketing muscle" and development resources made it an attractive parent for Analytica. "Obviously, I'm sorry we didn't reach a huge level of success, but I feel good about Borland marketing the product." Michelman said he plans to start his own company to develop business productivity software, focusing on network applications.

Jim Anderson of Merrill, Pickard, Anderson & Eyre in San Francisco, the lead investors in Analytica and also Borland stockholders, said the $500 Reflex lagged in the market but that the data base is now "potentially the largest product line Borland's ever had."

"A number of people approached us about joint marketing and cooperative ventures," Anderson said. "Borland was the best of all worlds." He said Analytica considered several types of mergers, including taking over smaller companies itself.

Industry speculation was that Analytica's investors had become impatient for return on their investments. Reflex, while lauded upon its introduction earlier this year for stretching filing cabinet data base concepts into analytical tools, nonetheless is the company's long-awaited and only product. Analytica recently had run into hard times, laying off about a dozen people in the past six months and dropping some from the payroll by voluntary early retirement.

Borland, on the other hand, rapidly gained acclaim for its high-quality, pragmatic inexpensive business software. Both the hallmark Sidekick and Borland's Turbo Pascal programming language sell for $69.95, the vendor said.

Borland dealers will sell Reflex at its new price through March 1986, after which the price will increase to $149.95, the company said.

Firm collects in second suit

By James Connolly

OAKLAND, Calif. — Three years ago, the owners of a leather goods cleaning business walked out of a San Francisco federal courtroom with a shocking victory in hand, a $2.6 million win over NCR Corp., on a claim that NCR sold them a minicomputer that it knew would not work.

The Glovertorium, Inc., a wholesale leather and suede cleaner accepted NCR's payment of $2.6 million, including $2 million in punitive damages, and scrapped its faulty NCR System 8200. The award was, at the time, the largest ever assessed against a computer vendor in a fraud case.

At the time of the NCR verdict, The Glovertorium had replaced the NCR system with an MAI/Basic Four Model 410B and software supplied by Computer Systems Development, Inc. of Pleasant Hill, Calif.

Foiled again

But, once again, The Glovertorium found they had a system that did not work. The owners went back into court and recently came out with another win, this time a $130,000 judgment against Computer Systems Development.

In the latest case, presented before a jury in Alameda County Superior Court, Judge Richard Bancroft dismissed a fraud charge. The verdict came in after a 73-day trial on The Glovertorium's claims of breach of contract and negligence on the part of Computer Systems Development. MAI/Basic Four was not a defendant.

The Glovertorium's attorney maintained that Computer Systems Development officials were inexperienced and nonexperts in applications software development and that previously they had not provided such customized software for businesses such as The Glovertorium.

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Blue chip service from IBM

From page 111

Interview with Rep. Ed Zschau

mittee was the [renewal of the] Export Administration Act — export controls on high-technology products being a major subject in that bill.

I was able to bring to the process some real-life experience and understanding of how the provisions really cut, rather than just thinking about it theoretically.

Second, the House Republican leadership asked me to chair the Task Force on High-Technology Initiatives ... [which] made 14 different legislative recommendations.

When I came to town, the debate was over industrial policy — that there ought to be some sort of competitiveness council and our government ought to decide where the opportunities are and then subsidize and provide special help in those areas, the so-called industrial targeting concept.

But the task force developed a new concept that we should target the process of innovation. That's where economic growth comes from, that's how you get productivity improvements and competitiveness.

We should be analyzing each government policy in terms of whether it enhances the environment for new ideas and R&D and technology advancement or stifles it. In areas where it stifles it, we should tear down the roadblocks, and in those areas where we could do more to provide incentives for the proper activities we should do more.

One example is in tax reform.

Simplicity and fairness are all good, but we ought to be looking at that tax reform proposal in terms of competitiveness.

In the area of tax reform, it seemed that the high-technology industry's effort to get a 25% research and development tax credit and a capital gains tax cut was going well, but recently the House Ways and Means Committee staff gave the industry a setback. Can you pick up the momentum again?

I don't know what the rationale of the staff is — whether they just don't like economic growth or they don't like R&D or whether they have a misconception that this is going to help them raise revenue and isn't going to affect economic growth. ... But I think it is really dumb.

If in the interest of picking up extra revenue you destroy some of the engine for economic growth, you're going to lose economic growth rather than gain it.

So I don't know whether it's reversible. Frankly, I would not bet that we're going to get a tax reform bill this year because this is just one obstacle. If you make proposals that take a group that was at least lukewarm in its favor of tax reform and turn them against it, and then you do that to a whole lot of other groups, you may find that you just don't even have the support you had before.

And there wasn't a whole lot of support ... before.

When you visit with the American Electronics Association (AEA), what do the executives tell you about tax reform?

The American Electronics Association has been one of those [groups] mildly supportive of the president's tax reform proposal. ... But I don't think the AEA feels a desperate need for tax reform.

I think they feel a desperate need for maintaining the R&D tax credits that are going to expire at the end of this year; they feel a desperate need to get the federal budget deficit down and relieve some of the upward pressure on the dollar; they feel a desperate need to make sure that this trade deficit issue is handled not to the detriment of exporting industries.

If we erect protectionist [trade] barriers, the possibility of retaliation against our exporters is great.

On the trade issue, what's the philosophical basis for your free-trade position?

It's very simple. If you have barriers to the market mechanism — whether they're price supports or quotas or whatever — it distorts the marketplace mechanism.

In international trade, we are very reliant on imports; we are also reliant on exports.

If we begin to erect barriers in various ways, we not only prevent dollars from getting into the hands of our customers ..., but also we run the risk of retaliation and increasing prices to U.S. consumers.

That ultimately could cost us jobs.

On the other hand, we should not tolerate unfair practices like dumping. The semiconductor industry is pointing out that there is ample evidence of dumping going on in [the U.S. of] some memory chips. We should not tolerate barriers to our access to foreign markets. We should not tolerate subsidies that are in clear violation of our agreements and the principles of free trade.

How do you make sure the foreign competitor follows the fair rules? Ultimately, you have to play or threaten to play your trump card, which is access to the U.S. market.

The difference between a free trader or fair trader and a protectionist is that a protectionist seeks trade barriers as an end in themselves to [prevent] competition, whereas a free trader will use the threat, or perhaps the imposition, of a trade barrier in order to achieve a free-trade/fair-trade environment.

When it comes to trade issues, our government's actions should protect the ability of our companies to be treated fairly — like a policeman or referee. Our government hasn't done that in the past. ... But the president recently has adopted a new attitude. He's appointed a new strike force, which is charged with finding unfair practices and going after them on their own initiative rather than waiting for the industries to come to them.

This is a new attitude that this large trade deficit has brought on, [a new attitude] that is very constructive.

But the bad thing that the large trade deficit has brought on is a series of purely protectionist measures. They're not designed to get fair trade, they're designed to keep out competition, and in my mind they are counterproductive.

Using your political crystal ball, what will happen in the House on trade legislation, and what form will trade sanctions take?

We will see a textile quota bill come up, and I will be fighting that because it is purely protectionist and arbitrary ... and I hope to be able to get enough votes to sustain a veto.

[In semiconductor trade with Japan] last year, we eliminated the tariffs both ways, but there are nontariff barriers that prevent equal access to the Japanese marketplace to U.S. manufacturers. I'm hoping that we don't feel a need to go further legislatively.

What we really have to do is make sure our negotiators have the tools they need to apply pressure if pressure is necessary ... and the authority to take that action ... and the sense of urgency to do something now.

But if we [in Congress] start getting into the negotiating process and we say arbitrarily that we're going to impose a 25% import surcharge on [Japan] until our trade balance is in line, that's not a negotiation. I think that kind of an action would have unintended, negative results.

> *"We should not tolerate unfair practices like dumping. ... We should not tolerate barriers to our access to foreign markets. We should not tolerate subsidies that are in clear violation of our agreements and the principles of free trade."*
>
> — Rep. Ed Zschau

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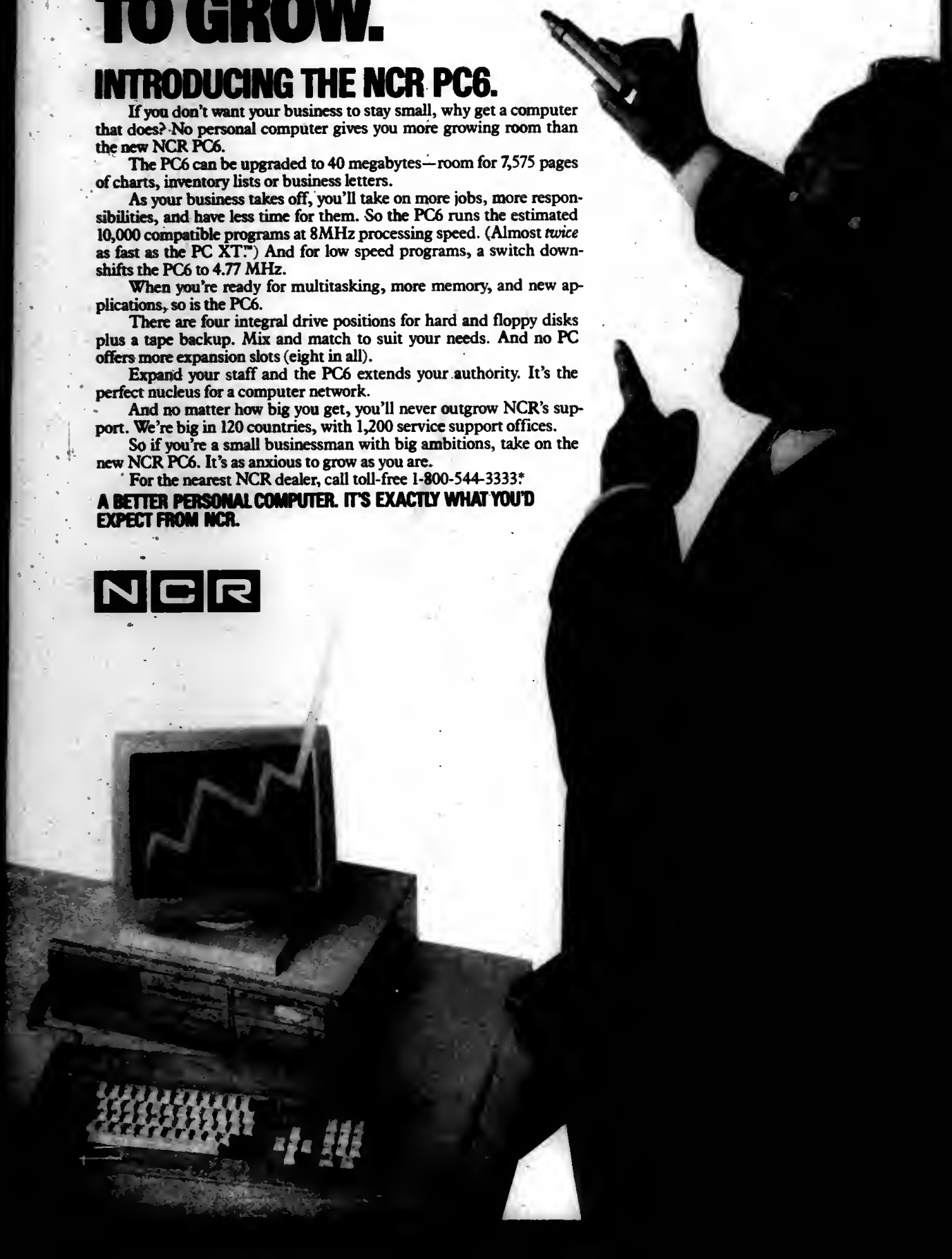

COMPUTER INDUSTRY

Sperry appoints chief

NEW YORK — Sperry Corp. Information Systems Group President Joseph J. Kroger was recently named president of the corporation. He is the first executive with a sales and marketing background to reach the No. 2 post of the computer, defense systems and farm equipment conglomerate.

Observers said they believe the promotion places Kroger, 51, in line to succeed Gerald G. Probst as chairman and chief executive officer. The president's chair had been vacant since 1982, when Probst was promoted to his current position formerly held by the late J. Paul Lyet.

Kroger, formerly also an executive vice-president of the corporation, has headed the Sperry computer group since 1981. Kroger was reported to have led the antitakeover contingent of Sperry executives that successfully thwarted the merger proposals of Burroughs Corp. earlier this year.

Kroger appears to have received the nod over Vincent R. McLean, Sperry's other executive vice-president and chief financial officer.

Mohawk Data sells off service businesses

PARSIPPANY, N.J. — Beleaguered Mohawk Data Sciences, Inc. officially exited the computer service business recently, selling off all but one of its businesses to raise an estimated $180 million in needed capital.

The mainframe and minicomputer vendor retained only its Qantel Systems, Inc. computer hardware unit, announcing the sale of five divisions to a new, unnamed company to be formed jointly by two New York venture capital firms. The sale involved MDS Service, MDS Systems Division U.S., MDS Credit Corp., H. M. Storms Co. and Mohawk Data's manufacturing operation in Herkimer, N.Y.

Mohawk Data will retain a 10% interest in the buyer, which is being formed by J. H. Whitney & Co. and Welsh, Caron, Anderson & Stowe. MDS Service will continue to be the exclusive maintenance provider for Qantel systems, and Mohawk Data will receive royalties from its current base of MDS Service customers.

Mohawk Data had previously sold its five European units for approximately $22 million.

Zilvitis named chief

BETHESDA, Md. — Patrick J. Zilvitis, a vice-president of Perkin-Elmer Corp. for the past two years and a 17-year IBM veteran, was recently named president of Martin Marietta Data Systems.

Zilvitis, 42, succeeds Richard J. Walters, who resigned in July. He will report to Norman R. Augustine, executive vice-president of parent firm Martin Marietta Corp.

Zilvitis most recently was vice-president of marketing for Perkin-Elmer's Data Systems Group. He left IBM in 1983 from the position of general manager of personal computer marketing, which he attained in 1981.

CAI posts quarter loss

IRVINE, Calif. — Computer Automation, Inc. (CAI) announced it will report a loss of $12 million to $15 million for the second quarter ended June 30 and further losses for the third quarter.

The vendor of automatic test equipment and industrial OEM computers also announced a consolidation move, including the sale of its commercial systems division and the appointment of Douglas L. Cutsforth as president and chief operating officer.

Cutsforth had previously served as vice-president and general manager of the company's industrial products division.

Other new assignments in the consolidation are Irwin W. Pfister to vice-president of marketing and product development, James R. Keener to director of OEM marketing and Gary R. Watson to director of operations.

Dataquest president leaves for Pyramid

MOUNTAIN VIEW, Calif. — Dataquest, Inc. President and Chief Executive Officer E. David Crockett has returned to the vendor side of the industry.

He recently became president of Pyramid Technology Corp., a Mountain View corporation that develops and markets superminicomputers based on the AT&T Unix operating system.

Ed Dolinar, who cofounded Pyramid in 1981, relinquished the president's seat for the chairmanship. Dolinar said Pyramid would benefit from Crockett's "high level of strategic and operational expertise."

Crockett joined San Jose, Calif.-based Dataquest in 1981 and became president in 1983. Before going into the market research business, Crockett spent nine years each at Hewlett-Packard Co. and IBM. He rose to computer strategy manager at HP.

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COMPUTERWORLD
THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

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COMPUTER INDUSTRY

MERGERS AND ACQUISITIONS

Docutel/Olivetti Corp., headquartered in Irving, Texas, announced that it had completed its previously announced merger with a subsidiary of **Ing. C. Olivetti & Co.** As a result of the merger, Docutel/Olivetti has become a wholly owned subsidiary of Olivetti. Also, all of Docutel/Olivetti's publicly held stock has been converted into a right to receive $5.50/share in cash.

■

Mentor Systems, Inc. of Lexington, Ky., has acquired **Amray Computer Systems** of Wichita and Hays, Kan. The acquisition makes Mentor one of the largest companies in the nation to specialize in accounting software for schools, governments and not-for-profit groups.

■

Equatorial Communications Co., located in Mountain View, Calif., and **Martin Marietta Corp.**, of Bethesda, Md., said that Martin Marietta has completed a previously announced $50 million purchase of an equity position in Equatorial, a provider of satellite-based data communications networks.

■

Corporate Software, Inc. of Denver has been acquired by **Integrated Management Systems**, also headquartered in Denver, and will operate in the future under the name of **Integrated Management Systems Micro Distribution Division.**

■

Gould, Inc. of Rolling Meadows, Ill., has acquired **International Cybernetics Corp.**, a Canoga Park, Calif., manufacturer of advanced computerized controls for factory and machine automation. The acquisition is part of Gould's Factory Automation Group.

■

Bishop Graphics, Inc., headquartered in Westlake Village, Calif., announced that merger discussions with **Perfectdata Corp.**, Chatsworth, Calif., have been terminated. Bishop Graphics does not intend to pursue the proposed acquisition of Perfectdata at this time.

■

Scientific Computers, Inc., based in Minnetonka, Minn., has announced the acquisition of **St. John's Data Systems, Inc.**, a supplier of integrated data collection systems. The acquisition price and terms were not disclosed.

■

Minneapolis-based **Control Data Corp.** will not acquire **Applied Information Memories**, a computer disk storage manufacturer in Milpitas, Calif., and Round Rock, Texas. The decision comes after CDC thoroughly reviewed the potential costs and benefits of the acquisition.

■

Eastman Kodak Co. has acquired the assets of **Xertronix, Inc.**, a maker of semiconductor cleaning equipment. Kodak has acquired equipment, patents and technology relating to Xertronix's line of wafer cleaning and inspection equipment. Both companies are based in Rochester, N.Y.

■

Automatix, Inc., Billerica, Mass., and **General Motors Corp.**, Detroit, have agreed on the principles of a $3 million applications development contract to be signed in the near future. Upon the signing of the agreement, Automatix has further agreed to grant GM the option to purchase up to 5% equity by Jan. 1, 1986, at a price equal to the lesser of $10/share or an average market price, with warrants to purchase up to 10% more at a formula price.

■

United Computer Systems, Inc., located in Cypress, Calif., has acquired the assets of **California Minicomputer Systems, Inc.** from **Weyerscorp, Inc.** for an undisclosed amount. The acquisition includes all rights, title and interest in California Minicomputer's Utilis product line.

■

Automatic Data Processing, Inc. of Roseland, N.J., has acquired the New York-based Brokerage Transaction Services Division of **Control Data Corp.** for an undisclosed amount of cash plus contingent payments based on the next year's business results.

■

Boulder, Colo.-based **NBI, Inc.** and **Peninsula Office Supply, Inc.** of Redwood City, Calif., announced the completion of the acquisition of Peninsula by NBI. Peninsula is the third office supplies company NBI has acquired.

SUPERSHORTS

Sperry Corp. has announced that it has established a new International Banking Center in Belgium. The center will support each Sperry subsidiary in the financial marketing sector.

■

Tandem Computers, Inc. has signed a cooperative agreement with **Integrated Technologies, Inc.** to develop and market advanced toll-free telephone service software for the telecommunications industry.

■

Hewlett-Packard Co. has established three new business units within its Design Systems Group to facilitate closer strategic collaboration among the 10 divisions, operations and laboratories within the group.

■

Xebec Corp. has reported that it is reorganizing its management to direct its operation toward and exploit the problems and opportunities of the current market environment in the microcomputer field. Owing to the scaling down of the company's operations and the consolidation of Xebec's facilities, Marcia Glow is resigning as the executive vice-president of operations.

■

The owner of **Computer Educational Center**, Shirley Dyer, has been elected president of the Independent Computer Consultants Association for the 1985-1986 term.

■

General Automation, Inc. has contracted the Customer Services Group of **Diebold Group, Inc.** to provide quality care third-party maintenance service for its Zebra line of computer systems throughout the U.S. and Puerto Rico.

■

Widcom, Inc. and **AT&T** announced they have entered into a joint marketing agreement for videoteleconferencing applications. The agreement includes the placement of Widcom equipment in seven AT&T sites for customer demonstrations and other joint sales activities.

■

Infotron Systems Corp. has created a separate division aimed at the data communications market. Itron, the new division, will sell through independent distributors to small and mid-size companies.

■

Digital Equipment Corp. has announced plans to construct a semiconductor manufacturing facility in Butlaw, Scotland. The construction of the 86-acre site is expected to begin in mid-1986 and be completed in early 1988.

■

Dataproducts Corp. and **3M Corp.** have signed a three-year agreement for 3M's Equipment Service and Support Division to service Dataproducts' LZR-2600 family of laser printers.

■

Honeywell, Inc. and **Zilog, Inc.** have signed a three-year third-party service agreement. Honeywell will be Zilog's subcontractor for maintenance service.

■

Honeywell, Inc. has signed a five-year third-party service agreement with **OSM Computer Corp.** Honeywell's Customer Services Division will install and maintain OSM's complete line of personal computers and associated products.

■

Fujitsu America, Inc. has announced the signing of a multimillion dollar contract to supply **Bell Atlantic Management Services, Inc.** with its advanced optical fiber transmission systems.

■

Intelogic Trace, Inc. and **Teknekron Infoswitch Corp.** have signed an agreement that provides for maintenance and installation services on a series of new products produced by Teknekron.

Centronics Data Computer Corp. has entered into a multiyear agreement with **International Computers Ltd.**, a British computer systems supplier.

■

Centronics Data Computer Corp. has signed a multiyear contract with **Pacific Bell.** Centronics will provide Pacific Bell with a complete line of dot matrix and band line printers to be used in internal applications.

■

Altos Computer Systems, Inc. has created a Federal Sales Division office in Vienna, Va. Altos will serve U.S. government customers including the Department of Defense, General Services Administration and civil agencies.

■

Lexidata Corp. has signed a two-year agreement with **Analogic Corp.** for the joint marketing of Lexidata's LEX 90 graphics display systems and Analogic's AP500 floating-point array processor.

■

Thomas C. Cain, vice-president of federal systems and government relations for **Computervision Corp.**, will take office as president of the **National Computer Graphics Association (NCGA).**

Dr. Phillip S. Mittelman, chairman of **MAGI**, has been selected president-elect of NCGA.

Richard A. Peters, vice-president of business development for **Calcomp, Inc.**, has been chosen as NCGA vice-president.

Carole A. Aldrich has been selected as the new NCGA treasurer. She directs strategic planning and business development for **Genigraphics Corp.**

Leland Rust, director of operations for **Markhard Corp.**, has been elected secretary of the association.

■

Comdisco Disaster Recovery Services, Inc. is planning construction of a recovery center. The facility will be located in San Ramon, Calif.

COMPUTER INDUSTRY

EXECUTIVE CORNER

Storage Technology Corp. has announced the appointment of **Richard R. Douglas** as corporate senior vice-president of marketing and services. Prior to joining Storage Technology, Douglas was with Honeywell, Inc.

■

Cary Hobbs has been named managing director for the UK at Ashton-Tate. Previously, Hobbs had worked for IBM in marketing and management positions.

■

Eagle Computer, Inc. has announced the following executive appointments: **Richard Sergo**, hired as executive vice-president and chief operating officer; **John Harwer**, hired as vice-president, marketing; **Edmund Hornby** has been hired to the newly created position of vice-president, international sales; **Richard Thunen** has been promoted to senior vice-president, strategic planning; and **Shelley Valk** has been named vice-president, finance and chief financial officer.

■

Carterfone Communications Corp., a subsidiary of Cable & Wireless North America, announced that it has named **Paul Holeman** vice-president and general manager of its distribution products division.

■

Nelson L. Hanks has been appointed senior vice-president, operations, at QMS, Inc. Prior to joining QMS, Hanks was production manager for Boeing Electronics, a subsidiary of Boeing Co.

■

Digital Equipment Corp. has announced the following promotions of engineering managers to the position of vice-president: **Robert M. Glorioso**, former group engineering manager, high-performance systems and clusters; **William J. Heffner**, former group manager of systems software; and **William D. Strecker**, previously manager of engineering product strategy and architecture.

■

The Network Services Division of Automatic Data Processing, Inc. announced the promotion of **Harold Rogers** to vice-president of the hardware engineering group.

From page 111

Meet spurs talk about leasing

nies occupied booths. Some of the biggest names in leasing were absent from the hall: IBM Credit Corp., Comdisco, Inc. and Greyhound Leasing and Financial Corp.

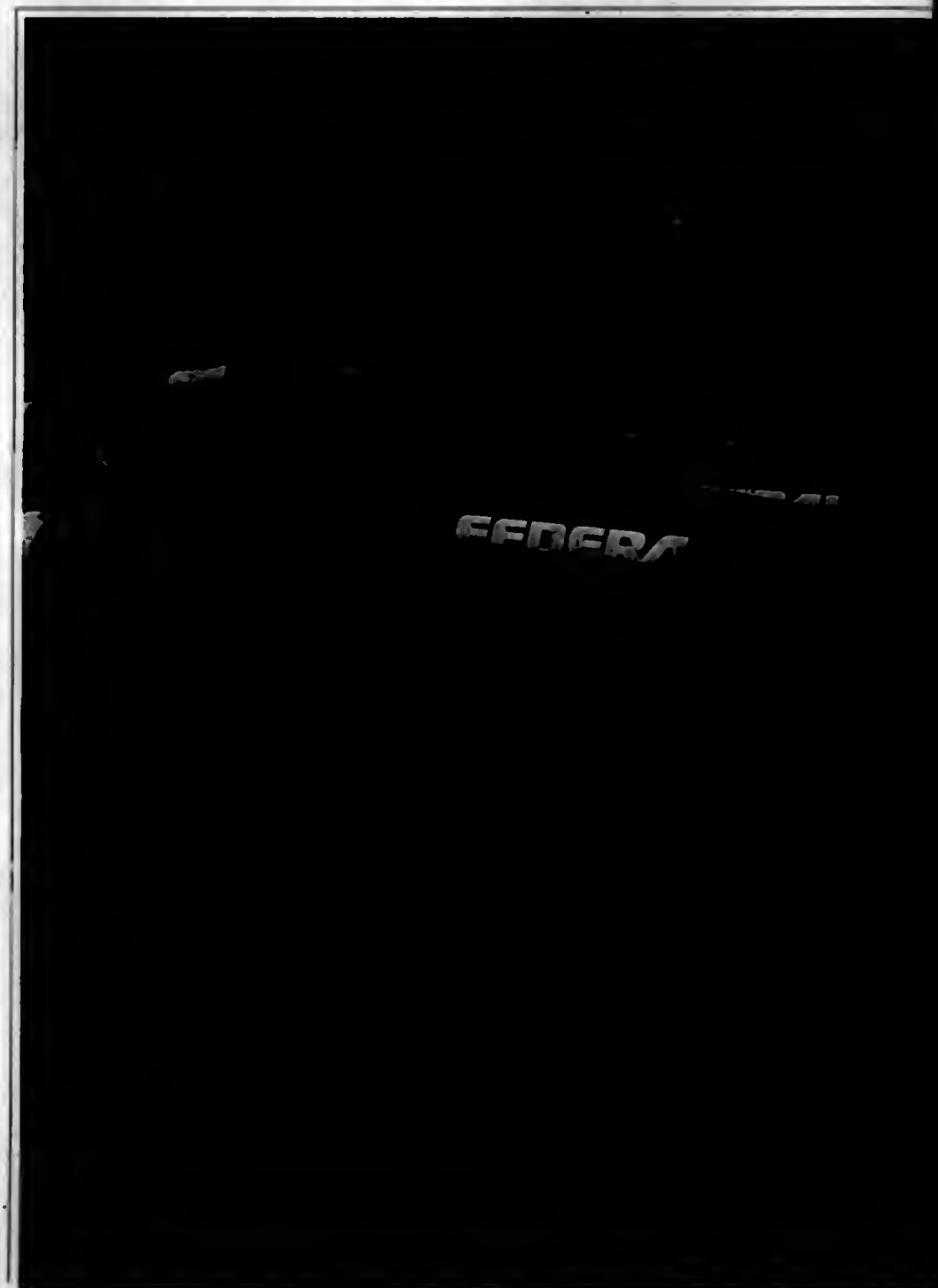
Off the exhibition floor, one of the favorite topics was the residual value of computer equipment. Royal Insurance Co. of America owns an IBM 3084 mainframe, and one 3084 owner was surprised when a speaker, Robert T. Fertig of Enterprise Information Systems, Inc. of Stamford, Conn., predicted that IBM will ship 500 Sierra 3090 Series 200 mainframes by the end of the year.

The residual value of 3084s will plummet if the 3090 line catches on that quickly, said James P. Quinn, assistant manager of computer operations for Royal Insurance in New York, the U.S. subsidiary of Royal Group, Inc. in London. Quinn questioned whether buyers appreciated the small initial performance difference between the two machines.

Conference speaker Donald E. Russell, principal analyst of the Kansas City Power & Light Co. in Kansas City, Mo., said his company was able to lease a package of equipment for only $3 million that would have cost $4.2 million through the vendor by using multiple sources of lease financing.

Lessees typically sign a three- to five-year contract that contains a "hell-or-high-water" clause specifying that they will make their monthly payments for the equipment, regardless of changes in their needs or technology. The clause has been frequently upheld in court, said Richard M. Contino, senior partner in Contino, Ross & Benedict, a New York law firm specializing in equipment financing.

In some cases, a lessor finds the computer manufacturer refusing to maintain the equipment because the leasing company encounters financial difficulty and fails to pay the vendor, Corea said. The lessor is then stuck with the hell-or-high-water clause and must continue paying on the equipment, he said.



Execs form antiapartheid panel

DETROIT — IBM President and Chief Executive Officer John Akers and Burroughs Corp. Chairman and Chief Executive Officer W. Michael Blumenthal are among those who will serve on a panel of U.S. executives working toward the elimination of apartheid in South Africa.

Blumenthal and General Motors Corp. Chairman Roger B. Smith jointly announced the U.S. Corporate Council on South Africa Sept. 20. The 10-member panel proposes to meet with top South African business leaders to discuss the situation and to promote steps to end the government's segregationist policies.

"Council members as corporate citizens of South Africa are deeply concerned about present conditions in that country," Blumenthal said. "They share the viewpoint of a growing number of senior South African business leaders who see an urgent need for changes and reform of the apartheid system, which will lead to its ultimate elimination."

From page 111

Rebound may be on hold

will be down substantially, almost all major computer stocks fell faster than autumn leaves during Hurricane Gloria.

The leading Burroughs culprit was Memorex Corp. 3680 disk drives, but calmer analysts apparently failed to convince investors that Burroughs will be alone in the bad news department. The Detroit-based vendor also pointed out that its domestic computer shipments in the quarter were lower than expected.

Any disk drive troubles are magnified 10 times at Control Data Corp., where the situation is starting to exhaust *Roget's Thesaurus* entries under "bleak." CDC's stock has dropped to bargain-basement levels, but any soundings in the financial community about a possible takeover inevitably meet the response, "Who would want it?"

The Minneapolis mainframe maker recently announced a four-day furlough for its 40,000 employees by the end of November. That's a fairly uneventful measure in the computer industry this year, except that CDC's current cash woes have some observers wondering whether the extended unpaid vacation is simply a cost-cutting move or an indication that the firm might have trouble meeting its payroll.

Other signs

A couple of other recent signs that the industry is not yet on the upswing exist. Ericsson, Inc., the Swedish communications leader, will close its Anaheim, Calif., plant that makes private branch exchanges and other switching equipment, resulting in 500 layoffs. Ericsson will also pull out of the U.S. microcomputer market at the end of the year.

In software, Ask Computer Systems, Inc. of Los Altos, Calif., said its sales and profits for the quarter ended Sept. 30 will be substantially below those of last year, when the minicomputer applications vendor posted $18 million in revenue.

Down the coast in Cupertino, Calif., however, Tandem Computers, Inc. came in with brighter news last week. The fault-tolerant pioneer announced another quarter of revenue growth, but President and Chief Executive Officer James Treybig warned, "Given the present conditions in the computer industry, we remain cautious about the near-term outlook."

From page 111

Atex selects AT&T in OEM contract

AT&T represented the "high-water mark" in fault-tolerant computing, even compared with better known commercial vendors such as Tandem Computers, Inc. and Stratus Computer, Inc.

"It's not as if AT&T is starting from scratch," he said. "[It is] actually the world's largest producer of fault-tolerant machines for internal use. [Its] 3B20 represents the best of the Stratus hardware approach and the Tandem software approach."

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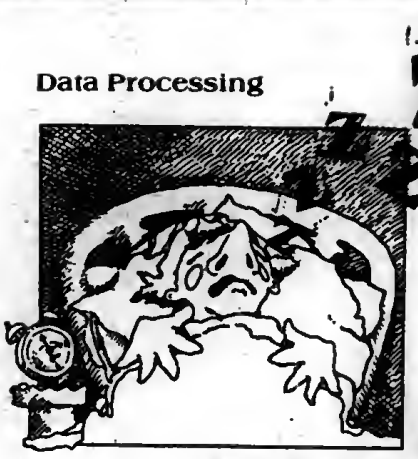

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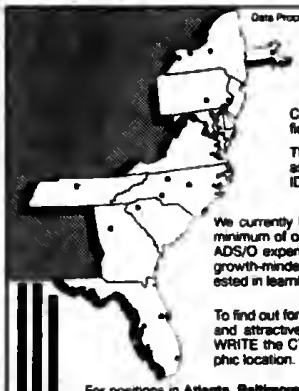

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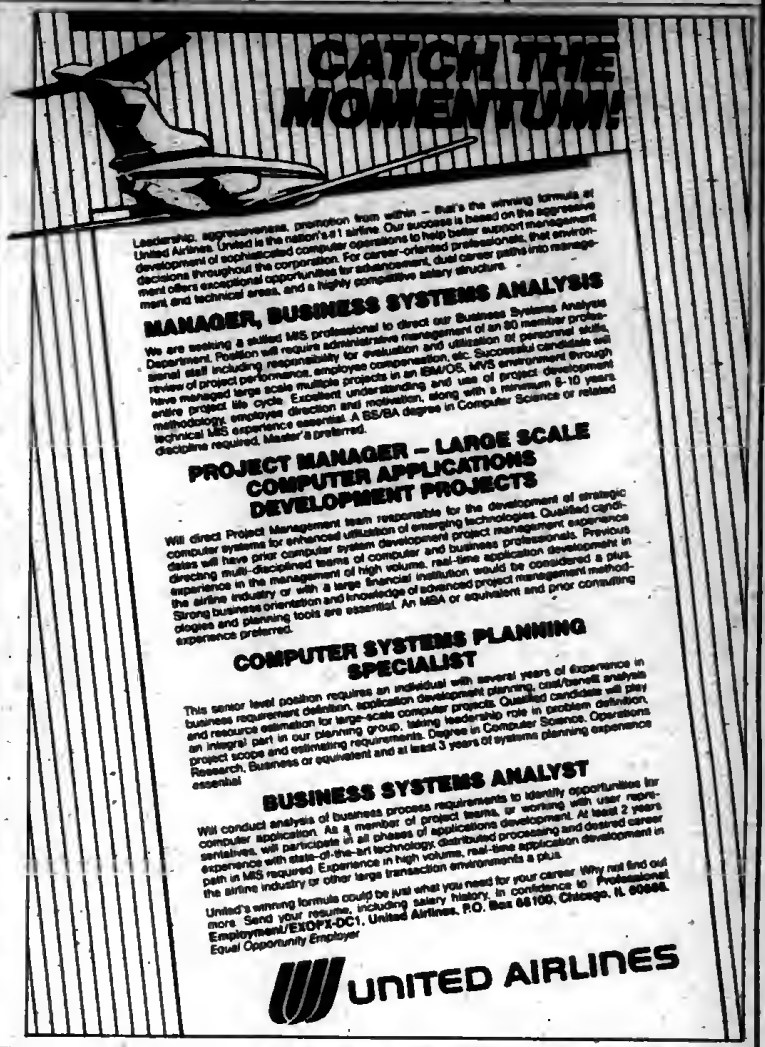

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REQUEST FOR PROPOSAL
REFERENCE: RFP [illegible]
Department on Aging
Connecticut Pharmaceutical
Assistance Contract to the Elderly
(Conn PACE)

To design, install, operate and maintain the claims processing and certain eligibility determination functions.

Anticipated issue date: October 21, 1985
Interested vendors must contact:
Gordon L. Partridge, Director
State of Connecticut
Resources & Facilities Planning
340 Capitol Avenue, 1st Floor
Hartford, CT 06106
(203) 566-3304

John W. Otterbein
Deputy Commissioner

NOTICE OF PUBLIC SALE OF COLLATERAL

Notice is hereby given that pursuant to the Uniform Commercial Code of Oregon, a public sale of collateral will be held on October 29, 1985 at 10:00 a.m., standard of time as established by Oregon Revised Statute 187.110, at 7180 S.W. Fir Loop, Portland, Oregon 97223.

The collateral consists of Computer Source Code and manuals related to individual and corporate tax return preparation, tax planning, inheritance tax and depreciation, and related computer equipment, office machines, furniture and miscellaneous supplies. Some of the collateral will be sold subject to a security interest which is prior to the security interest being foreclosed.

For additional information or to make arrangements for inspection of the collateral contact Beth King at (503) 241-5615.

A REQUEST FOR PROPOSALS
WILL BE ISSUED BY:

The State of Wyoming on October 15, 1985 for Computer Hardware and software for three County Courts. Software required will be for tracking criminal histories, docking, caseload scheduling, reporting, telecommunications and word processing. A turnkey system is desired. Copies of the RFP may be requested from:

Office of the Court Coordinator
Attention: Mr. Robert Duncan
Wyoming Supreme Court Building
Cheyenne, WY 82002

Requestors must supply list of previous clients.

STATE OF CONNECTICUT
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REQUEST FOR PROPOSAL
REFERENCE: RFP R886
UNIVERSITY OF CONNECTICUT
Payroll/Personnel System

Proposals will be requested for the delivery and installation of a comprehensive automated Payroll/Personnel System over the next two years. A Payroll System is needed immediately followed by and integrated with a Personnel System. Related modules to complete specific user requirements will be scheduled over a two year period. Other systems such as Accounting may be scheduled after Payroll and Personnel are complete.

Anticipated issue date: October 24, 1985
Interested vendors must contact:
Gordon L. Partridge, Director
State of Connecticut
Resources & Facilities Planning
340 Capitol Avenue, 1st Floor
Hartford, CT 06106
(203) 566-3304

John W. Otterbein
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NOTICE IS GIVEN that Kinetics Technology International Corporation, a Delaware corporation ("KTI"), as Secured Party will offer for public sale all assets of Cascade Graphics Development ("CGD"), a California corporation engaged in the development, manufacture and sale of computer software and a micro computer-based computer aided drafting workstation. The assets to be sold include, without limitation, computer software and hardware, cash, accounts receivable, inventory, equipment, furniture, contract rights, copyrights, trademarks, trade names, and other general intangibles.

The sale will occur at CGD's offices located at 1000 South Grand Avenue, Santa Ana, California, on December 2, 1985 at 10:00 A.M.

The winning bidder must, at the time and place of sale, pay the purchase price in full by either certified or cashier's check or by satisfaction of debt owed by CGD to the Secured Party or by any combination.

This sale is without warranty or representation by KTI and without recourse to KTI.

Interested bidders can obtain a list of assets and inspect them by writing to the undersigned.

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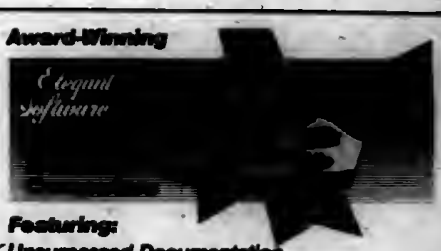

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1 Sales through dealers and carriers, street vendors and counter sales	None	None
2 Mail subscriptions	128,005	129,176
C. Total paid circulation	128,005	129,176
D. Free distribution by mail, carrier or other means samples, complimentary and other free copies	7,945	7,640
E. Total distribution (Sum of C and D)	135,950	136,816
F. Copies not distributed		
1 Office use, left over, unaccounted, spoiled after printing	2,649	2,584
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G. Total (Sum of E, F1 and 2 — should equal net press run shown in A)	138,599	139,400

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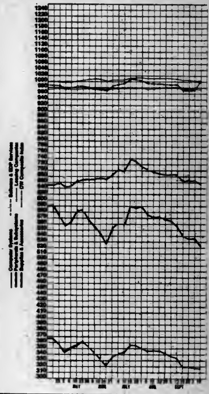
Computerworld Stock Trading Index



Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, OCTOBER 9, 1985

All statistics compiled, computed and formatted by TRADE QUOTES INC Cambridge Mass. 02139

E X C H		1985 RANGE (1)	CLOSE OCT 9 1985	WEEK NET CHNGE	WEEK PCT CHNGE
	COMPUTER SYSTEMS				
O	ALPHA MICROSYSTEMS	8- 13	9 1/8	- 1/4	-2.6
O	ALTOS COMPUTER SYST	7- 14	8 7/8	- 1/8	-1.3
A	AMDAHL CORP	10- 20	11 1/8	- 1/8	-1.1
O	APPLE COMPUTER INC	15- 31	15	- 5/8	-4.0
A	AT&T	19- 22	21 3/8	+ 1/8	-0.5
N	BURROUGHS CORP	51- 58	60	+13 1/8	-17.2
O	COMPAQ COMPUTER CO	6- 13	9 1/8	- 1/4	+2.8
N	COMPUTER AUTOMATION	3- 8	3 1/8	0	0.0
A	COMPUTER CONSOLES	5- 20	9 3/4	+ 1/8	+1.4
N	CONTROL DATA CORP	15- 38	18 3/8	+2 3/4	+17.6
O	CONVERGENT TECHNOL	6- 17	7 1/4	- 7/8	-10.7
O	CPT CORP	3- 12	5 1/8	+ 0/8	-8.0
N	CRAY RESEARCH INC	23- 61	60 3/4	-2	-4.1
O	DBIDY SYSTEMS CORP	21- 38	21 3/4	- 1/4	-1.1
N	DATA GENERAL CORP	31- 78	33	-6 1/8	-14.8
N	DATAPOINT CORP	4 85	+ 6/4	4	4.0
A	DIGITAL EQUIPMENT	30-130	108	-6 3/8	-5.6
A	ESCO INC	13- 18	14 3/8	0	0.0
N	ELECTRONIC ASSOC.	3- 8	4 1/8	+ 1/4	-5.7
N	FLOATING POINT SYS	18- 38	30 3/8	- 3/8	-2.3
N	FOXBORO	18- 38	30	0	0.0
N	GOULD INC	20- 34	18	-2 3/8	+11.0
A	HARRIS CORP	23- 35	22 7/8	- 1/8	-3.0
N	HEWLETT-PACKARD CO	30- 44	28 3/4	-2 3/4	-8.4
N	HONEYWELL INC	53- 87	60 1/8	-1 3/8	-2.3
N	IBM	118-138	120 1/4	+ 1/8	-0.1
O	IPL SYSTEMS INC	1- 4	4 3/8	+.1/16	+3.8
N	ITT CORP	28- 37	33 3/8	+ 3/8	-1.8
N	M/A-COM INC	10- 18	10	-1 1/8	-8.0
N	MANAGEMENT ASSIST	2- 08	3		0.0
A	MATSUSHITA ELEC(ADR)	40- 38	30 3/8	+2 7/8	-2.8
N	MODULAR COMPUTER SYS	6- 10	6	+ 1/8	+6.0
O	MOHAWK DATA SCI	2- 15	3	+ 1/8	+18.3
N	MOTOROLA INC	29- 08	31 1/2	-2 1/3	+7.2
N	NAT'L SEMICONDUCTOR	10- 17	11 3/8	+ 1/8	+6.3
A	NBI INC	13- 21	12 1/8	-1 3/8	-11.8
N	NCR	23- 08	32 1/8	-1 3/8	-5.1
N	PERKIN-ELMER	22- 80	23 3/8	- 1/2	-2.0
A	PRIME COMPUTER INC	13- 00	15 1/2	-1 1/4	-7.4
N	SPERRY CORP	35- 58	88 1/8	-2 3/8	-3.1
O	STRATUS COMPUTER INC	8- 18	18 3/4	-3	-5.8
O	TANDEM COMPUTERS INC	14- 38	13 7/8	- 7/8	-3.8
N	TANDY CORP	20- 37	33 3/8	+ 3/8	+1.1
O	TELEVIDEO SYSTEMS	3- 7	1 7/8	- 1/8	-6.3
N	TELXON CORP	7- 18	14 1/2	- 3/4	-4.8
N	TEXAS INSTRUMENTS	36-1-5	88 3/8	-4 7/8	-6.3
A	ULTIMATE CORP	8- 24	11 1/2	- 3/8	-3.3
O	VECTOR GRAPHICS INC	0- 1	1/4	+	+14.1
A	WANG LABS "B"	15- 08	13 3/4	- 0/8	-3.8
A	WANG LABS "C"	15- 08	18 3/8	+ 1/8	+0.7
N	XEROX CORP	47- 88	47 1/4	+1 1/8	-2.3
	LEASING COMPANIES				
N	COMDISCO INC	8- 20	10 1/2	- 3/4	+3.7
O	CONTINENTAL INFO SYS	9- 16	10 3/8	+ 1/2	+4.0
O	FINALCO GROUP INC	3- 7	6	- 1/2	-11.1
O	PHOENIX AMERICAN INC	2- 6	1 1/8	- 1/8	-5.3
O	SELLECTERM INC	8- 14	7 3/8	0	0.0
N	U.S. LEASING	32- 43	32 3/8	+ 1/8	+0.7
	COMPONENTS				
N	ADVANCED MICRO DEV	23- 41	23 1/4	-1	-4.1
O	AEM & SEMICONDUCTOR	8 18	8 3/4	+ 1/8	+1.0
N	ANALOG DEVICES INC	13- 25	10 7/8	- 1/2	-3.4
O	ANALOGIC CORP	8- 16	11 7/8	+ 3/8	-3.1
A	APPLIED MAGNETICS CP	8- 13	12 1/8	0	0.0
O	MACCO CORP	3- 10	4 1/4	0	0.0
O	MICRO MASK INC	8- 10	3 7/8	+ 1/8	-2.6
N	TERADYNE	18- 18	18	-1 3/4	-8.8

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E X C H		1985 RANGE (1)	CLOSE OCT 9 1985	WEEK NET CHNGE	WEEK PCT CHNGE
	SOFTWARE & EDP SERVICES				
O	ADVANCED COMP TECH	3- 4	3 3/4	+ 1/8	+18.3
A	ADVANCED SYSTEMS INC	8- 20	13 7/8	+ 3/8	+2.7
N	AGS COMPUTERS INC	10- 17	14 0/8	- 3/4	-4.8
O	AMERICAN SOFTWARE	8- 19	8 1/2	- 1/2	-5.5
N	ANACOMP INC	1- 4	2 3/4	- 1/4	-8.8
O	ANALYSTS INTL CORP	6- 11	7 7/8	- 3/8	-4.8
N	APPLIED DATA RES	18- 30	40 7/8	-1 7/8	-3.4
N	ASHTON TATE	9- 10	10 3/4	-1 3/8	+13.2
O	BBS COMPUTER SYSTEMS	8- 20	7 3/8	-3 1/2	-31.1
N	AUTOMATIVE COMP INC	1- 7	1 3/4	0	0.0
N	AUTOMATIC DATA PROC	33- 39	40 1/8	-1 3/3	-3.4
A	COMPUTER ASSOC INT'L	18- 00	31	-3	-13.3
N	COMPUTER HORIZONS	8- 11	11 1/2	+ 3/8	+3.3
O	COMPUTER NETWORK	8- 10	7	- 1/4	+3.4
N	COMPUTER SCIENCES	12- 18	23 7/8	- 1/8	+3.0
O	COMPUTER TASK GROUP	10- 20	18 1/8	0	0.0
O	COMPUTER USAGE	1- 3	3 1/4	0	0.0
O	COMPUTONE SYSTEMS	8- 11	8 3/8	- 1/8	+2.3
O	CONSERV CORP	1- 8	3 7/8	0	0.0
O	COMSHARE	80 10	8 7/8	0	0.0
A	CULLINET SOFTWARE	18- 33	14	-3 1/3	-18.3
O	CYCARE SYSTEMS INC	18- 27	30 1/8	- 3/4	-3.0
O	HOGAN SYSTEM INC	6- 12	3 7/4	- 1/8	-2.8
N	GENERAL ELECTRIC CO	53- 83	57 3/4	- 1/4	-0.4
N	GENL MOTORS E (EDS)	17- 47	33 1/4	-3 7/8	-10.4
N	GTE CORP	38- 08	30 7/8	+ 0/8	-0.4
O	INFORMATION SCIENCE	1- 8	7 3/8	+ 0/8	+33.7
O	INFOTRON SYSTEMS CP	20- 80	18 1/4	-1 3/4	-10.2
O	KEANE ASSOCIATES	8- 18	12 3/8	- 1/4	-1.8
N	LOGICON	20- 38	30 1/8	0	0.0
O	LOTUS DEVELOPMENT CP	18- 30	14 3/8	+ 7/8	+3.0
O	MCI COMMUNICATIONS	7- 11	8 3/8	- 1/4	+2.8
O	AMEI MCI AMED INC	8- 18	0 1/4	- 3/8	-3.0
O	MATHEMATICAL APP GRP	2- 8	1 3/8	+ 1/8	+3.1
O	MICOM SYSTEMS INC	18- 30	14	-1 1/4	-8.0
O	MICROPRO INT'L CP	3- 4	3 1/4	- 1/8	-0.3
O	NATIONAL DATA CORP	7- 18	13 4/8	+ 1/8	-0.8
O	ON-LINE SOFTWARE INT	4- 10	8	0	0.0
O	PANSOPHIC SYSTEMS	11- 08	18	- 1/3	-3.3
N	PLANNING RESEARCH	8- 17	18 1/8	- 1/4	-1.3
O	POLICY MGMT SYSTS CP	18- 30	18	+ 1/3	-2.7
O	PROGRAMMING & SYS	4- 8	2 3/4	0	0.0
O	REYNOLDS & REYNOLDS	28- 44	30 1/4	- 1/4	-0.8
N	SEI CORP	11- 19	19	+ 1/2	+2.7
O	SHARED MEDICAL SYS	28- 38	33 3/4	+1 1/8	+3.6
N	SCIENTIFIC COMPUTERS	5- 12	5 3/8	- 1/8	-4.3
N	SOFTWARE AG	11- 22	10 1/4	- 3/8	-4.3
N	UCS CORP	10- 18	11 1/2	+ 1/8	+1.0
N	UCCEL	8- 13	10	- 3/8	-3.8
	PERIPHERALS & SUBSYSTEMS				
A	AG INTERNATIONAL	5- 8	4	+ 7/8	+18.3
O	ANDERSON JACOBSON	3- 11	3 3/8	+ 1/8	+5.0
O	AST RESEARCH INC	7- 23	14 1/8	+ 3/8	-2.3
O	AUTO-TROL TECHNOLOGY	3- 10	4 3/8	- 3/8	-7.1
O	AVANT-GARDE COMPUTNG	8- 20	7 3/8	- 7/8	+13.2
O	BANCTEC INC	8- 12	8 1/2	- 1/8	-1.4
N	BEEHIVE INT'L	4- 2	3/8	0	0.0
N	BOLT,BERANEK & NEW	18- 31	28	- 1/8	-0.6
O	CAMBEX CORP	1- 3	7/8	- 1/8	-12.7
N	CENTRONICS DATA CORP	3- 18	3 3/4	+ 1/4	+9.8
A	CETEC CORP	8- 10	8 7/8	- 1/4	-3.8
A	CODENOLL/CIRONICS	4- 3	4 1/3	- 1/4	-6.3

E X C H		1985 RANGE (1)	CLOSE OCT 9 1985	WEEK NET CHNGE	WEEK PCT CHNGE
O	COMPUGRAPHIC CORP	34- 33	24 7/8	+ 1/8	40.0
O	COMPUTER TRANSCEIVER	1- 4	3/8	-	-6.1
N	COMPUTERVISION CORP	30- 88	8 3/8	+2 3/8	-18.4
N	CONRAC CORP	13- 18	13	- 1/8	-0.4
	DATAPRODUCTS CORP	11- 24	11 1/2	- 1/3	-4.1
N	DATARAM CORP	3- 7	3 3/4	0	0.0
O	DATA SWITCH CORP	4- 8	0 1/8	- 1/8	-4.5
O	DATUM INC	8- 8	0 1/8	+ 1/8	+2.3
O	DECISION DATA COMPUT	8- 10	11 3/4	- 3/8	-3.2
O	EMDATA INC	3- 29	3 3/4	+ 1/4	+7.8
O	EVANS & SUTHERLAND	6- 13	17	+1	-0.7
O	GANDALF TECHNOLOGIES	3- 08	8 7/8	+ 1/2	-0.3
N	GEN'L DATA CORP INC	8- 30	8 1/8	-2 7/8	-23.8
N	HAZELTINE CORP	3- 28	23 1/8	- 3/4	-2.8
O	ICOT CORP	8- 17	8	- 1/8	-2.0
O	INFORMATION INTL INC	4- 18	13 3/8	- 1/8	-0.8
O	INTECOM INC	3- 08	4 7/8	- 3/8	-7.1
O	INTEL CORP	7- 08	23	-1 3/4	-7.0
A	LUNDY ELECTRONICS	4- 14	11 1/8	+ 1/8	+1.4
O	MEGADATA CORP	4- 13	4 1/4	0	0.0
A	MSI DATA CORP	8- 30	8 7/8	- 1/8	-1.4
N	MOHAWK CORP	19- 27	30 3/4	- 1/8	-0.4
O	NETWORK SYSTEMS CORP	30- 43	30 1/8	-6 3/8	-17.0
N	NO AMERICAN PHILIPS	30- 42	33 1/2	-1 0/8	-4.8
O	NORTHERN TELECOM LTD	1- 08	31 7/8	-1 1/8	-6.0
O	ONEX	1- 3	1/4	0	0.0
N	PARADYNE CORP	7- 14	7 3/8	+ 1/8	-1.5
A	PENRIL CORP	8- 38	7 7/8	+1 1/8	-13.3
N	PLESSEY CO (ADR)	8- 23	18 1/2	- 7/8	-4.3
O	PRINTRONIX INC	8- 13	11 1/8	0	0.0
O	QMS INC	8- 11	8 5/8	- 1/8	-1.3
O	QANTEX CORP	8- 17	3 3/8	+ 1/8	-4.3
N	RECOGNITION EQUIP	8 31	8	- 1/4	-2.2
N	SANDERS ASSOCIATES	11- 37	33 1/8	-3 4/4	-8.2
O	SCAN-TRON CORP	8- 18	18 1/4	0	0.0
A	SCIENTIFIC ATLANTA	6- 16	11 1/4	- 7/8	+7.3
O	SEAGATE TECHNOLOGY	2- 12	8 1/8	- 3/8	-4.3
A	STORAGE TECHNOLOGY	1- 8	1 7/8	0	0.0
O	SYKES DATATRONICS	8- 11	1/4	+ 1/8	+100.0
O	3 COM INC	8- 38	3 3/8	- 3/8	-6.2
A	TAB PRODUCTS CO	4- 10	10 3/4	+ 1/8	-0.7
O	TANDON CORP	8- 13	8	0	0.0
O	TEC INC	6- 08	7 3/8	- 1/8	-3.1
N	TEKTRONIX INC	30- 38	47 3/8	-2 1/2	-3.8
N	TELEX	5- 08	80 3/8	+1 7/8	+4.3
N	TERADATA SYSTEMS CP	1- 23	3/4	+ 1/4	+33.3
N	TIMEPLEX INC	8- 21	10	- 3/4	-3.7
N	TYLAN CORP	3- 8	8 3/8	- 3/8	-6.1
O	VISUAL TECHNOLOGY	4- 10	7/8	- 1/16	-6.7
	SUPPLIES & ACCESSORIES				
A	AMERICAN BUS PRODS	81- 28	30 1/8	- 3/8	-1.4
A	BARRY WRIGHT	17- 30	17 1/8	+ 1/8	+0.7
A	DUPLEX PRODUCTS INC	13- 20	17 1/8	-1	-8.4
A	ENNIS BUS. FORMS	10- 30	18 3/8	-1 1/8	-8.7
A	GG COMPANY	74- 80	80 1/4	+ 1/8	+0.1
A	MOORE CORP LTD	13- 25	18 1/8	+ 1/8	+0.8
O	STANDARD REGISTER	18- 09	30	0	0.4
N	WALLACE CORP SERVICES	30- 40	38 3/8	+ 5/8	+1.8

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